



Bharatiya Vidya Bhavan's
Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058



END SEM/RE-EXAM EXAMINATION -MAY / JUNE 2025

Program:

T.Y. Civil Engineering *Sum VI*

Duration: 3hr

Course Code: PC-BTC601

Maximum Points: 100

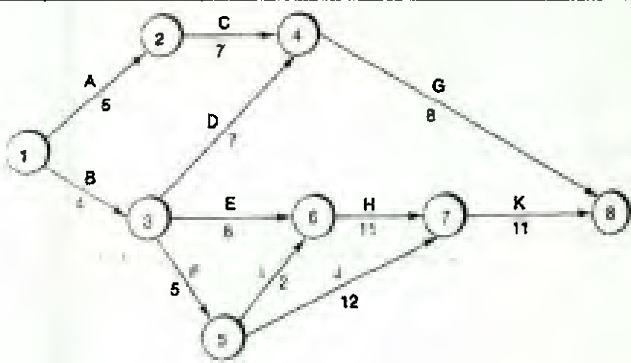
Course Name: Construction Engineering and Management

Semester: VI

Instructions:

23/6/25

1. Question no. 1 is compulsory
2. Attempt any 4 questions out of remaining 6 questions.
3. Neat diagrams must be drawn wherever necessary.
4. Assume Suitable data if necessary and state it clearly.

Q. No.		Questions	Points	CO	BL	Module
1	a	A contract is awarded to you for the construction of flyover project in a metro city Mumbai.	20	CO3	BL2	2, 5, 4
		i. Draw WBS for the project. ii. Suggest suitable organization structure for the same. iii. List the records to be maintained on the site for construction of Flyover project in a metro city Mumbai. iv. Discuss the causes of accidents in the construction of flyover project in a metro city Mumbai and their mitigation measures.				
2	a	For the network diagram given	10			3
		 a) Find project duration b) Perform forward pass and backward pass calculations. c) For the network shown find out critical path. d) Find earliest start time, EFT, LST and LFT of the activity. e) Calculate total float and free float and tabulate your result				
	b	Bring out the difference between an accident, an incident and a near-miss, and give examples of the same.	5	CO1	BL2	4

	c	Discuss the concept of resource levelling and resource smoothing. Explain their importance.	5	CO2	BL4	3																																												
3	a	Following network diagram represents activities associated with the project	10	CO2	BL3	3																																												
	<table><tr><td>Activities</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td><td>I</td></tr><tr><td>Optimistic time</td><td>5</td><td>18</td><td>26</td><td>16</td><td>15</td><td>6</td><td>7</td><td>7</td><td>3</td></tr><tr><td>Pessimistic time</td><td>10</td><td>22</td><td>40</td><td>20</td><td>25</td><td>12</td><td>12</td><td>9</td><td>5</td></tr><tr><td>Most likely time</td><td>8</td><td>20</td><td>33</td><td>18</td><td>20</td><td>9</td><td>10</td><td>8</td><td>4</td></tr></table>						Activities	A	B	C	D	E	F	G	H	I	Optimistic time	5	18	26	16	15	6	7	7	3	Pessimistic time	10	22	40	20	25	12	12	9	5	Most likely time	8	20	33	18	20	9	10	8	4				
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	Determine																																																	
	i) Expected completion time ii) Variance of each activity iii) The earliest and latest completion time of each event. iv) Critical path v) The probability of expected completion time of the project if the original scheduled time of completing the project is 41.5 weeks. vi) The duration of the project that will have 95% chance of being completed.																																																	
	b	Discuss method statements and explain how it is useful for execution.	5	CO2	BL2	5																																												
	c	You are working at heights in a construction project, suggest the suitable Personal Protective Equipment (PPE) along with their utility.	5	CO2	BL2	6																																												
4	a	Prepare A, B and C ranking of the different items for the data given below. Also draw the graph.	10	CO2	BL2	4																																												
		<table><tr><th>Sr. No.</th><th>Material</th><th>Annual Consumption</th><th>Unit cost in ₹.</th></tr><tr><td>1</td><td>I</td><td>1000</td><td>500</td></tr><tr><td>2</td><td>II</td><td>3000</td><td>2500</td></tr><tr><td>3</td><td>III</td><td>2000</td><td>70</td></tr><tr><td>4</td><td>IV</td><td>4000</td><td>80</td></tr><tr><td>5</td><td>V</td><td>3000</td><td>900</td></tr><tr><td>6</td><td>VI</td><td>5000</td><td>1000</td></tr><tr><td>7</td><td>VII</td><td>100</td><td>50</td></tr><tr><td>8</td><td>VIII</td><td>100</td><td>70</td></tr><tr><td>9</td><td>IX</td><td>50</td><td>30</td></tr><tr><td>10</td><td>X</td><td>100</td><td>20</td></tr></table>	Sr. No.	Material	Annual Consumption	Unit cost in ₹.	1	I	1000	500	2	II	3000	2500	3	III	2000	70	4	IV	4000	80	5	V	3000	900	6	VI	5000	1000	7	VII	100	50	8	VIII	100	70	9	IX	50	30	10	X	100	20				
Sr. No.	Material	Annual Consumption	Unit cost in ₹.																																															
1	I	1000	500																																															
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3	III	2000	70																																															
4	IV	4000	80																																															
5	V	3000	900																																															
6	VI	5000	1000																																															
7	VII	100	50																																															
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10	X	100	20																																															
4	b	Discuss the cost of accidents and cost of quality.	10	CO2	BL3	6																																												

5	a	A construction company purchases 15,000 bags of cement annually. Each bag of cement costs ₹ 400 and the cost incurred in procuring each lot is ₹ 250. The cost of carrying is 30%. What is the most economic order quantity? What is the average inventory level? If the lead time of procuring cement is 3 weeks, determine the reorder point.	6	CO2	BL2	6																																			
	b	Discuss the direct cost and indirect cost during the life cycle of construction project.	8	CO1	BL2	7																																			
	c	Discuss the safety precautions to be taken during the use of overhead crane in case of high-rise building construction project.	6	CO1	BL1	4																																			
6	a	Discuss the job layout and its importance in project execution	4	CO1	BL2	4																																			
	b	Discuss the traits/skills of project manager for the successful delivery of the construction project.	6	CO1	BL2	4																																			
	c	Data for the network is as shown below:	10	CO3	BL4	7																																			
	<table><tr><th colspan="2">Activity</th><th>Normal Duration In week</th><th>Normal Duration In week</th><th>Normal Cost ₹</th><th>Crash cost ₹</th></tr><tr><td>A</td><td>10-20</td><td>12</td><td>6</td><td>14000</td><td>29000</td></tr><tr><td>B</td><td>10-30</td><td>16</td><td>10</td><td>8000</td><td>17000</td></tr><tr><td>C</td><td>20-30</td><td>8</td><td>2</td><td>12000</td><td>18000</td></tr><tr><td>D</td><td>20-40</td><td>10</td><td>6</td><td>16000</td><td>30000</td></tr><tr><td>E</td><td>30-40</td><td>10</td><td>6</td><td>10000</td><td>22000</td></tr></table> Indirect cost of the project is ₹ 3000/- per week. Draw project network and find critical path. Find optimum cost and optimum duration. Draw time scaled diagram for each stage during crashing.						Activity		Normal Duration In week	Normal Duration In week	Normal Cost ₹	Crash cost ₹	A	10-20	12	6	14000	29000	B	10-30	16	10	8000	17000	C	20-30	8	2	12000	18000	D	20-40	10	6	16000	30000	E	30-40	10	6	10000
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C	20-30	8	2	12000	18000																																				
D	20-40	10	6	16000	30000																																				
E	30-40	10	6	10000	22000																																				
7	a	Explain in detail vertical production method of scheduling.	5	CO2	BL2	3																																			
	b	It is proposed to carry out highway construction project.	11	CO3	BL2	1,2																																			
	a) List the equipment required for highway construction. b) Discuss the factors which governs the productivity of equipment and labour. c) Discuss the corrective measures to improve the labour and equipment productivity.																																								
	c	A project involves an initial outlay of ₹ 30,00000/-.	4	CO1	BL2	4																																			
	The salvage value at the end of 5 year=₹ 3,00,000/-.																																								
	<table><tr><th>End of year</th><th>O & M Cost ₹</th><th>Revenue ₹</th></tr><tr><td>1</td><td>2,00000.0</td><td>8,00000.0</td></tr><tr><td>2</td><td>2,50000.0</td><td>10,00000.0</td></tr><tr><td>3</td><td>3,00000.0</td><td>12,00000.0</td></tr><tr><td>4</td><td>3,50000.0</td><td>14,00000.0</td></tr><tr><td>5</td><td>4,00000.0</td><td>16,00000.0</td></tr></table> Draw cash flow diagram						End of year	O & M Cost ₹	Revenue ₹	1	2,00000.0	8,00000.0	2	2,50000.0	10,00000.0	3	3,00000.0	12,00000.0	4	3,50000.0	14,00000.0	5	4,00000.0	16,00000.0																	
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Standard Normal Probabilities

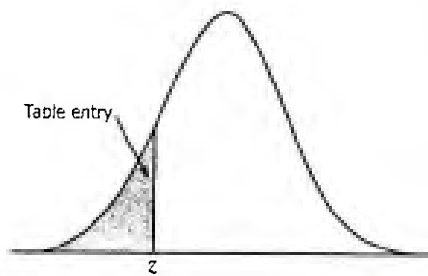


Table entry for z is the area under the standard normal curve to the left of z .

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

Standard Normal Probabilities

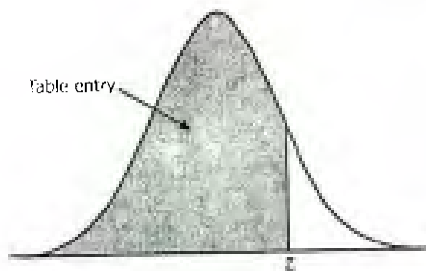


Table entry for z is the area under the standard normal curve to the left of z .

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998



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END SEM/RE-EXAM EXAMINATION -MAY / JUNE 2025

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Duration: 3hr

Maximum Points: 100

Semester: VI

1. Question no. 1 is compulsory
2. Attempt any 4 questions out of remaining 6 questions.
3. Neat diagrams must be drawn wherever necessary.
4. Assume Suitable data if necessary and state it clearly.

Q. No.	Questions	Points	CO	BL	Module																															
1	a A contract is awarded to you for the construction of high-rise building project in a metro city Mumbai.	20	CO1 CO2 CO3	BL2	2,4,5 & 6																															
	i) Draw WBS for the project. ii) Suggest suitable organization structure for the same. iii) List the records to be maintained on the site for construction of high-rise building project. iv) Discuss the causes of accidents in the construction of high-rise building project and their mitigation measures.																																			
2	a A construction project consist of 14 activities for which activity durations are given in weeks.	10	CO2	BL2	3																															
	<table><tr><th>Activity</th><th>durations in weeks</th><th>Activity</th><th>durations in weeks</th></tr><tr><td>1-2</td><td>2</td><td>4-7</td><td>4</td></tr><tr><td>1-3</td><td>12</td><td>5-6</td><td>6</td></tr><tr><td>1-4</td><td>4</td><td>6-8</td><td>3</td></tr><tr><td>2-3</td><td>8</td><td>8-10</td><td>5</td></tr><tr><td>3-8</td><td>4</td><td>7-9</td><td>9</td></tr><tr><td>4-5</td><td>4</td><td>9-10</td><td>1</td></tr><tr><td>4-6</td><td>8</td><td>10-11</td><td>4</td></tr></table> i) Draw network diagram. ii) Perform forward pass and backward pass calculation and determine total duration in weeks. iii) Determine critical path and comment about it. iv) Calculate total float. v) Calculate free float.	Activity	durations in weeks	Activity	durations in weeks	1-2	2	4-7	4	1-3	12	5-6	6	1-4	4	6-8	3	2-3	8	8-10	5	3-8	4	7-9	9	4-5	4	9-10	1	4-6	8	10-11	4			
Activity	durations in weeks	Activity	durations in weeks																																	
1-2	2	4-7	4																																	
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2-3	8	8-10	5																																	
3-8	4	7-9	9																																	
4-5	4	9-10	1																																	
4-6	8	10-11	4																																	
	b Discuss inspection and quality control Plan for highway construction project. List out the preliminary tests to be carried out on the material and their frequency.	10	CO2	BL2	6																															

3	a	The following network shows a three time estimates for each activity.	9	CO2	BL3	3																																										
		<table border="1"> <tr> <th>Activity</th><th>t opt.</th><th>t mean</th><th>t pess.</th></tr> <tr><td>1-2</td><td>1</td><td>1</td><td>7</td></tr> <tr><td>1-3</td><td>1</td><td>4</td><td>7</td></tr> <tr><td>1-4</td><td>2</td><td>2</td><td>8</td></tr> <tr><td>2-5</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>3-5</td><td>2</td><td>5</td><td>14</td></tr> <tr><td>4-6</td><td>2</td><td>5</td><td>8</td></tr> <tr><td>5-6</td><td>3</td><td>6</td><td>15</td></tr> </table> i) Determine critical path and total duration. ii) Calculate standard deviation and variance iii) Find the probability that the project will be completed at least 4 weeks earlier than expected project duration. iv) Find the probability that the project will be completed in 4 weeks later than expected project duration.	Activity	t opt.	t mean	t pess.	1-2	1	1	7	1-3	1	4	7	1-4	2	2	8	2-5	1	1	1	3-5	2	5	14	4-6	2	5	8	5-6	3	6	15														
Activity	t opt.	t mean	t pess.																																													
1-2	1	1	7																																													
1-3	1	4	7																																													
1-4	2	2	8																																													
2-5	1	1	1																																													
3-5	2	5	14																																													
4-6	2	5	8																																													
5-6	3	6	15																																													
	b	Discuss common causes of time and cost overrun in the case of highway construction project.	6	CO2	BL2	5																																										
	c	Discuss role of manual construction method as against use of machinery in road construction along with advantage of machinery in road making.	5	CO2	BL2	1																																										
	a	Prepare a checklist for Concreting work	4	CO2	BL2	5 & 6																																										
	b	5. Differentiate (a) CPM and PERT (b) AOA and AON	6	CO1	BL1	3																																										
		Prepare A, B and C ranking of the different items for the data given below .Graph is mandatory.	10	CO2	BL3	4																																										
4	c	<table border="1"> <tr> <th>Item no</th><th>No. of units</th><th>Unit cost ₹</th><th>Item no</th><th>No. of units</th><th>Unit cost ₹</th></tr> <tr><td>1</td><td>7000</td><td>5.0</td><td>7</td><td>60000</td><td>0.2</td></tr> <tr><td>2</td><td>24000</td><td>3.0</td><td>8</td><td>3000</td><td>3.5</td></tr> <tr><td>3</td><td>1500</td><td>10.0</td><td>9</td><td>300</td><td>8.0</td></tr> <tr><td>4</td><td>600</td><td>22.0</td><td>10</td><td>29000</td><td>0.40</td></tr> <tr><td>5</td><td>38000</td><td>1.5</td><td>11</td><td>11500</td><td>7.10</td></tr> <tr><td>6</td><td>40000</td><td>0.5</td><td>12</td><td>4100</td><td>6.20</td></tr> </table>	Item no	No. of units	Unit cost ₹	Item no	No. of units	Unit cost ₹	1	7000	5.0	7	60000	0.2	2	24000	3.0	8	3000	3.5	3	1500	10.0	9	300	8.0	4	600	22.0	10	29000	0.40	5	38000	1.5	11	11500	7.10	6	40000	0.5	12	4100	6.20				
Item no	No. of units	Unit cost ₹	Item no	No. of units	Unit cost ₹																																											
1	7000	5.0	7	60000	0.2																																											
2	24000	3.0	8	3000	3.5																																											
3	1500	10.0	9	300	8.0																																											
4	600	22.0	10	29000	0.40																																											
5	38000	1.5	11	11500	7.10																																											
6	40000	0.5	12	4100	6.20																																											
	a	A project is completed 30% and it is proposed to monitor and control the project. Discuss the process of EVM in this context and state the significance of SV, CV, SPI, CPI.	10	CO1	BL2	5																																										
5	b	Discuss the need of work permit. You have visited SPJIMR construction site where in as part of permission, a work permit is obtained discuss in detail format of general work permit.	10	CO2	BL2	6																																										
6	a	Differentiate Quality control and quality assurance	5	CO1	BL2	6																																										
	b	A construction company purchases 10,000 bags of cement annually. Each bag of cement costs ₹ 380 and the cost incurred in procuring each lot is ₹ 150. The cost of carrying is 25%.What is the most economic order quantity? What is	6	CO2	BL1	4																																										

		the average inventory level? If the lead time of procuring cement is 2 weeks, determine the reorder point.																																																						
	c	You are appointed as a safety officer on the construction of High-rise building construction project, discuss the roles and responsibility of the same.	9	CO2	BL3	6																																																		
7	a	Following table gives data for normal time & cost and Crash cost and crash time. Indirect cost is Rs 10/-day.	12	CO3	BL3	7																																																		
		a) Draw network, Find critical path. b) Draw time scaled diagram for each stage of crashing c) Determine optimum time and corresponding cost of crashing d) Draw the graph of direct cost, indirect cost and total cost.																																																						
		<table><tr><td></td><td colspan="2">Normal</td><td colspan="2">Crash</td></tr><tr><td>Activity</td><td>Time, days</td><td>Cost ₹</td><td>Time, days</td><td>Cost ₹</td></tr><tr><td>1-2</td><td>6</td><td>60</td><td>4</td><td>100</td></tr><tr><td>1-3</td><td>4</td><td>60</td><td>2</td><td>200</td></tr><tr><td>2-4</td><td>5</td><td>50</td><td>3</td><td>150</td></tr><tr><td>2-5</td><td>3</td><td>45</td><td>1</td><td>65</td></tr><tr><td>3-4</td><td>6</td><td>90</td><td>4</td><td>200</td></tr><tr><td>4-6</td><td>8</td><td>80</td><td>4</td><td>300</td></tr><tr><td>5-6</td><td>4</td><td>40</td><td>2</td><td>100</td></tr><tr><td>6-7</td><td>3</td><td>45</td><td>2</td><td>80</td></tr></table>						Normal		Crash		Activity	Time, days	Cost ₹	Time, days	Cost ₹	1-2	6	60	4	100	1-3	4	60	2	200	2-4	5	50	3	150	2-5	3	45	1	65	3-4	6	90	4	200	4-6	8	80	4	300	5-6	4	40	2	100	6-7	3	45	2	80
	Normal		Crash																																																					
Activity	Time, days	Cost ₹	Time, days	Cost ₹																																																				
1-2	6	60	4	100																																																				
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2-4	5	50	3	150																																																				
2-5	3	45	1	65																																																				
3-4	6	90	4	200																																																				
4-6	8	80	4	300																																																				
5-6	4	40	2	100																																																				
6-7	3	45	2	80																																																				
	b	What is float or slack in project scheduling? Explain different types of float.	5	CO2	BL2	3																																																		
	c	Draw cash flow diagram for the project details given below.	3	CO1	BL2	4																																																		
		<table><tr><td>Description</td><td>Machine X</td><td>Machine Y</td></tr><tr><td>Purchase Price ₹</td><td>15,00,000.00</td><td>20,00,000.00</td></tr><tr><td>Machine Life (Years)</td><td>7</td><td>5</td></tr><tr><td>Salvage value at the end of Machine life ₹</td><td>2,00,000.00</td><td>3,00,000.00</td></tr><tr><td>Annual O & M Cost ₹</td><td>3,00,000.00</td><td>2,50,000.00</td></tr></table>					Description	Machine X	Machine Y	Purchase Price ₹	15,00,000.00	20,00,000.00	Machine Life (Years)	7	5	Salvage value at the end of Machine life ₹	2,00,000.00	3,00,000.00	Annual O & M Cost ₹	3,00,000.00	2,50,000.00																																			
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Standard Normal Probabilities

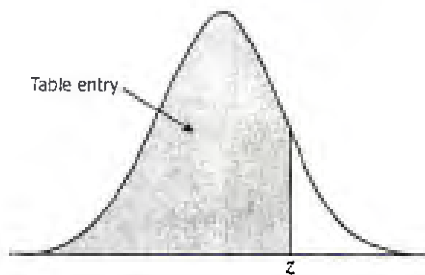


Table entry for z is the area under the standard normal curve to the left of z .

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Standard Normal Probabilities

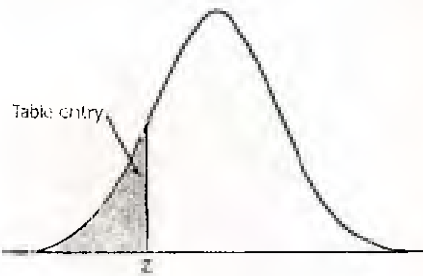


Table entry for z is the area under the standard normal curve to the left of z .

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641



SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai - 400058



End Semester Exam - May 2025 Examinations/

~~Re-Exam - June 2025~~

Program: B.Tech - Civil Engineering

Sem VI

Duration: 3 Hour

Course Code: PC-BTC602

Maximum Points: 100

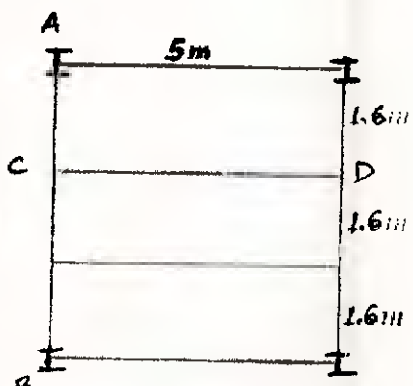
Course Name: Design Of Steel Structures

Semester: VI

Notes:

1. Assume any missing data and state the same clearly
2. Use of IS 800-2007 and steel tables is allowed
3. Draw neat sketches to illustrate your answers
4. For all steel plates and angles, $f_y = 250\text{MPa}$, $f_u = 410\text{MPa}$

19/5/25

Q.No.	Questions	Points	CO	BL	Module
1.	The member of a roof truss carries the following unfactored loads : DL = 60kN (Tensile); LL - 55kN (Tensile); WL = 80kN (Compressive) a. What will be the design loads as per IS 800:2007 load combinations? b. Design the element as a tension member and also design its connection with 10mm thick gusset plate using 4.6grade bolts c. Check the member designed above for the safety in compression according to the load combinations generated.	20	1,3,6	1,3,6	1,2,3,7
2)	A floor of hall has beam layout as shown in figure below:  Design beam AB and CD. Loads are as follows : RCC slab depth = 130mm Floor finish load = 1.5kN/m^2 Live load = 3kN/m^2 Wall thickness = 150mm (All beams support walls of height 2.7m)	20	1,5	1,5,6	1,5



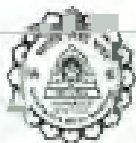
SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai - 400058



End Semester Exam - May 2025 Examinations / ~~Re-exam June 2025~~

	Design the beams and provide all necessary checks <i>Assuming the beams to be laterally supported</i>				
3.a)	A single angle strut (loaded through single leg) carries a design compressive force of 150kN. The length of member between centres of intersection is 1.25m. Design the section as per IS 800:2007. Assume the connection to be hinged with two bolts at each end	10	1,3	3	3
3.b)	Calculate the design compressive resistance of a built-up column consisting ISMB 500 with one cover plate 400 x 20 mm on each flange and having a length of 5 m. Assume that the bottom of column is fixed and top is hinged	10	3	3	3
4.	Design a built up laced column to carry 1150kN design axial load using two channels facing back to back. Also design lacing and its connection using 4.6grade bolts. The column is hinged at both ends and the length is 4.05m. Draw neat sketch showing all the details	20	3	3	3
5.a)	Design a stiffened seat connection for an ISMB 250 to transfer 60kN factored reaction to ISHB 400 using 4.6grade bolts. Draw neat sketch to show connection details	15	2	2	6
5.b)	Explain the procedure for calculating wind load on roof truss.	05	4	1,6	7
6.a)	Design a gusseted base connection for a column of section ISHB 300 to transfer a design load of 850kN on a concrete pedestal of M15 grade. The SBC of soil is 450kN/m ² . Use 4.6 grade bolts of 20mm diameter.	12	4	4	4
6.b)	Design a welded connection for a single angle tension member ISA 130x130x10. The angle is subjected to an axial force of 150kN.	08	2	2	2
7.a)	Explain the difference between laterally supported and laterally unsupported beam. When can a beam be considered as laterally supported as per IS 800:2007. Provide examples for both types of beams.	05	1	1	1
7.b)	Explain the advantages of welded connection over bolted connection	05	1	2	1
7.c)	An ISMB 500 section is used as a beam over a span of 6 m, with simply supported ends. Determine the maximum factored uniformly distributed load that the beam can carry if the beam is laterally unsupported.	10	5	5	5

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~~End Semester Exam - May 2025 Examinations~~
Re-exam - June 2025

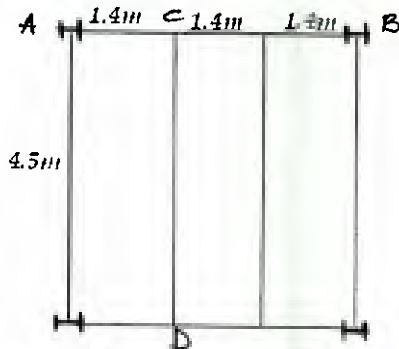
Program: B.Tech -Civil Engineering *Sum VI*
Course Code: PC-BTC602
Course Name: Design Of Steel Structures

Duration: 3 Hour
Maximum Points: 100
Semester: VI

Notes:

1. Assume any missing data and state the same clearly
2. Use of IS 800-2007 and steel tables is allowed
3. Draw neat sketches to illustrate your answers
4. For all steel plates and angles, $f_y = 250\text{MPa}$, $f_u = 410\text{MPa}$

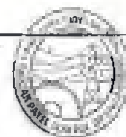
24/6/25

Q.No.	Questions	Points	CO	BL	Module
1.	The member of a roof truss carries the following unfactored loads : DL = 50kN (Tensile); LL = 45kN (Tensile); WL = 40kN (Compressive) a. What will be the design loads as per IS 800:2007 load combinations? b. Design the element as a tension member and also design its connection with 10mm thick gusset plate using 4.6grade bolts c. Check the member designed above for the safety in compression according to the load combinations generated.	20	1,3,6	1,3,6	1,2,3,7
2)	A floor of hall has beam layout as shown in figure below:  Design beam AB and CD. Loads are as follows : RCC slab depth = 120mm Floor finish load = 1.5kN/m^2 Live load = 3.5kN/m^2 Wall thickness = 230mm (All beams support walls of height 2.5m)	20	1,5	1,5,6	1,5



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~~End Semester Exam - May 2025 Examinations~~ / Re-exam June 2025

	Design the beams and provide all necessary checks <i>Assuming the beams to be laterally supported</i>				
3.a)	A single angle strut (loaded through single leg) carries a design compressive force of 100kN. The length of member between centres of intersection is 1.6m. Design the section as per IS 800:2007. <i>Assume the connection to be hinged with two bolts at each end</i>	10	1,3	3	3
3.b)	A column carries a design axial load of 950kN. Design the column section using rolled steel section when <i>both ends are restrained against rotation and translation</i> . Length of member is 4.5m	10	3	3	3
4.	Design a built up laced column to carry 1350kN design axial load using two channels facing back to back. Also design lacing and its connection using 4.6grade bolts. The column is hinged at both ends and the length is 4.85m. Draw neat sketch showing all the details	20	3	3	3
5.a)	Design a stiffened seat connection for an ISMB 250 to transfer 80kN factored reaction to ISHB 400 using 4.6grade bolts. Draw neat sketch to show connection details	15	2	2	6
5.b)	Explain the procedure for calculating wind load on roof truss.	05	4	1,6	7
6.a)	Design a gusseted base connection for a column of section ISHB 300 to transfer a design load of 950kN on a concrete pedestal of M20 grade. The SBC of soil is 400kN/m ² . Use 4.6 grade bolts of 20mm diameter.	12	4	4	4
6.b)	Design a welded connection for a single angle tension member ISA 150x150x15. The angle is subjected to an axial force of 250kN.	08	2	2	2
7.a)	Explain the classification of sections : plastic, compact, semi-compact and slender based on moment - rotation characteristics	05	1	1	1
7.b)	Explain the advantages and disadvantages of using steel as a structural material	05	1	1	1
7.c)	A simply supported beam ISMB 400 has been used over a span of 5m to carry a design load of 20kN/m. Check the safety of the beam in <i>shear, flexure and deflection</i> when the beam is <i>laterally unsupported</i>	10	5	5	5



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Munshi Nagar, Andheri (W) Mumbai – 400058



~~End Semester~~ /Re- Examination

~~May~~/June 2025 (R22)

Program: UG Third Year *Civil Eng VI*
Course Code: PC-BTC603
Course Name: Foundation Engineering

Duration: 3 Hours
Maximum Points: 100
Semester: VI

Notes:

- **Question 1 is compulsory. Attempt any four out of remaining six questions**
- Assume suitable data if necessary and state it clearly
- Clearly write units everywhere. Points will be deducted in each place units are missing
- Figure on right indicate maximum points for the given question, course outcomes attained, and Bloom's Taxonomy Level

Q.			Points	CO	BL
1	a	Classify piles as per IS2911. Justify the importance of classifying piles in this manner.	5	3	2
	b	What is apparent earth pressure diagram in relation to a braced cut? Illustrate with neat sketches the apparent pressure diagram for different soil types. Explain its use.	5	4	2
	c	Estimate the net ultimate capacity of a 2m wide strip footing resting on dry, cohesionless soil having $\phi = 30^\circ$, bulk unit weight of 18.2kN/m^3 , embedment depth of 1.5m, using IS code recommendations. Assume depth factor =1 and load to be vertical. GWT is 10m below GS.	5	2	3
	d	A retaining wall 6 m high retains soil having the following properties: cohesion = 25kN/m^2 , friction angle 32° , unit weight 17.8kN/m^3 . Assuming cracks occur, determine the active thrust exerted on the wall.	5	1	3
2	a	What is CPRF? Discuss why it is considered as a sustainable alternative to conventional foundations	5	4	2,3
	b	Illustrate with a neat sketch a typical reinforced earth wall and show its major components	5	4	2
	c	For the retaining wall shown in Figure 1 below, calculate the factor of safety against sliding.	10	1	3
3	a	Differentiate between general, local and punching shear failure	5	2	2
	b	Differentiate between shallow and deep foundations	5	2,3	2
	c	Classify conduits. Discuss in detail how negative projecting conduits are different from positive projecting conduits illustrating with neat sketches.	10	4	2
4	a	A retaining wall 8 m high has a smooth vertical back and retains a horizontal, cohesionless backfill. The top layer of soil up to a depth of 5m below GS has density of 1.8g/cc with drained friction angle as 30° , while the lower layer	10	1	3



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		extends to a depth of 12m below the top layer and has an average density of 2g/cc and drained friction angle of 34°. If the wall is expected to move away from the backfill, sketch the pressure distribution along the wall to enable the structural engineer to design reinforcement for the wall. Assume GWT to be deep below.			
	b	Explain the plate load test for shallow foundations as per IS 1888	10	2	2
5	a	Draw a typical stress distribution diagram for a sheet pile penetrating clay	4	1	2
	b	Using simplistic method determine the embedment depth of a sheet pile retaining 6 m of granular soil having unit weight of 19 kN/m ³ and friction angle of 30°. Assume only two thirds of the passive resistance is developed over the embedded length.	6	1	3
	c	A 3x3 pile group was driven in soft clay extending to a large depth. The diameter of each pile is 300 mm and length is 9 m. If the unconfined compression strength of the clay is 90 kPa and pile spacing is 0.9m c/c, calculate the capacity of the pile group. Assume adhesion factor as 0.75 and Factor of safety as 2.5	10	3	3
6	a	For the data given in Problem 1 d, determine the passive resistance and the point of action.	5	1	3
	b	With reference to IS 19117: 2025 for CPRF, explain the following terms: load sharing ratio, pile enhanced raft and raft enhanced pile	5	4	2
	c	Design a rectangular combined footing for two columns (A and B) both of size 350 mm x 350 mm spaced at 5 m c/c resting in soil with allowable bearing pressure of 180 kN/m ² . Column A carries a load of 700 kN and B carries 1080 kN. Maximum projection of footing beyond column A is 0.5 m. Illustrate with neat sketches.	10	2	3
7	a	The foundation of a single storey RCC framed structure is to be designed such that it can carry a load of 955 kN beneath each column. The borehole data is shown below. Design a square footing and justify using a shallow foundation. Use relevant IS code specifications and assume suitable FoS. 0 to 1.8 m: Surficial loose fill 1.8 to 10 m: c-φ soil with cohesion of 30kN/m ² and friction angle as 32° with $\gamma_b = 17.2\text{kN/m}^3$ and $\gamma_{sat} = 20.7\text{kN/m}^3$. Below 10 m: Highly weathered rock GWT is at 2.5m below ground surface	10	2	3
	b	The following data refers to a pile load test carried out on a 300 mm diameter pile of length 10 m. Estimate the allowable load on the pile as per IS 2911 (Part 4): 2013 (R2018)	10	3	3

Load on pile (kN)	150	200	250	300	400	500	600
Total settlement (mm)	1.45	2.25	2.75	3.6	5.75	10.75	30



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End Semester / ~~Re-Examination~~

May/~~June~~ 2025 (R22)

Program: UG Third Year

Course Code: PC-BTC603

Course Name: Foundation Engineering

Duration: 3 Hours

Maximum Points: 100

Semester: VI

Notes:

- **Question 1 is compulsory. Attempt any four out of remaining six questions**
- Assume suitable data if necessary and state it clearly
- Clearly write units everywhere. Points will be deducted in each place units are missing
- Figure on right indicate **maximum points** for the given question, **course outcomes attained**, and **Bloom's Taxonomy Level**

Q.		Points	CO	BL
1	a	5	3	4
	b	5	4	3
	c	5	2	2
	d	5	1	2
2	a	5	4	2
	b	5	4	2
	c	10	3	3
3	a	5	2	2, 3
	b	5	2, 3	2
	c	10	4	3

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		Determine the strut loads if the struts are placed at 4m centre to centre along the length of the excavation.			
4	a	A 10 m high retaining wall retains non-cohesive soil as backfill. The void ratio and angle of friction of the retained soil are 0.7 and 30° , respectively in loose state and 0.4 and 40° in dense state, respectively. Assuming specific gravity as 2.7, calculate the active and passive pressure for both cases. Comment on how densification affects the pressures.	10	1	3
	b	Explain in detail with neat sketches, the Culmann's graphical method for estimation of active earth pressure	10	1	2
5	a	A contractor at a site is refusing to put adequate drainage behind a retaining wall. Convince him why an appropriate drainage system is necessary	5	1	2
	b	Explain the Housel method of determining bearing capacity of a shallow foundation.	5	2	3
	c	A 300 mm diameter pile is driven into a deposit of sand having $\phi=32^\circ$, $\gamma_b=1.80$ g/cc, $\gamma_{sat}=1.95$ g/cc, $k_{tan}\delta = 1.2$ and $N_q=34$. The pile is driven to a length of 11.5 m and water table is located at 3 m below GL. Take critical depth of pile as 15d. Find the safe load the pile can carry if factor of safety is 2.50.	10	3	3
6	a	A smooth backed vertical wall is 6.3 m high and retains a soil with a bulk unit weight of 18 kN/m^3 and $\phi = 18^\circ$. The top of the soil is level with the top of the wall and is horizontal. If the soil surface carries a uniformly distributed load of 4.5 kN/m^2 , determine the total passive resistance per metre length of the wall and its point of application.	5	1	3
	b	Discuss the load transfer mechanism of a CPRF foundation and discuss the various interaction coefficients. Illustrate with a neat sketch	5	4	2
	c	Explain in detail how plate load test results are interpreted. State the limitations of plate load test.	10	2	3
7	a	Proportion a combined footing for two columns A1 and A2 each with size $0.46 \times 0.46 \text{ m}$, spaced at 5.5 m centre to centre, carrying load of 2000 and 1500 kN, respectively. The foundation is restricted to 0.5m beyond the edge of A1 due to property boundary and the soil has a net allowable bearing pressure of 190 kPa. Show a neat sketch of the arrangement.	10	2	3
	b	Determine the consolidation settlement of a pile group of 5×5 piles with length 21m constructed in 25m thick clay deposit having $\gamma_{sat} = 19.8 \text{ kN/m}^3$, $e_0=1.1$ and $C_c=0.3$. This clay is underlain by impermeable rock. The pile group carries a load of 2000kN and the piles are 500mm in diameter and placed 3d c/c.	10	3	3



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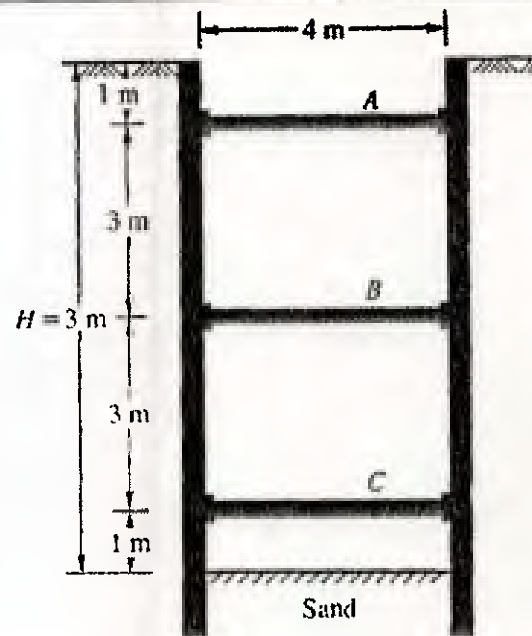
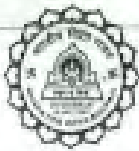


Figure 1

**END SEM / RE-EXAM EXAMINATION MAY / JUNE 2025**

Program: T.Y. B. Tech

Civil Engg

Duration: 3 Hrs.

Course Code: PC-BTC604

Maximum Points: 100

Course Name: Design of RCC Elements

Semester: VI

Instructions for the Students:

1. Attempt any 05 (FIVE) questions
2. Assume suitable data if necessary and state it clearly.
3. Illustrate your answers with neat sketches wherever required.
4. Use of IS 456 – 2000 is permitted in examination.

26/6/25

Q. No.	Questions	Points	CO	BL	Module No.
1 a	Explain the assumptions in design of structures using working stress method.	04	1	2	1
1 b	A RCC beam of size 230 x 450 mm overall, is reinforced with 3 bars of 16 mm diameter on tension side. Determine moment carrying capacity of the beam. Assume concrete of grade M-20 and steel of grade Fe-415. Use Working Stress Method.	08	1	4	2
1 c	A RCC beam of size 230 x 750 mm overall, is reinforced with 3 bars of 25 mm diameter on tension side and 2 bars of 12 mm diameter on compression side. The beam is simply supported over a span of 8 m. Determine maximum superimposed uniformly distributed load the beam can carry over the entire span. Assume concrete of grade M-20 and steel of grade Fe-415. Use Working Stress Method.	08	1	4	2
2 a	Explain characteristic loads and characteristic strength in limit state method of design.	04	1	2	3
2 b	Determine area of tension steel required for a beam of size 230 x 600 mm overall subjected to superimposed uniformly distributed load of 15 kN/m over the entire span of 4 m. Assume concrete of grade M-20 and steel of grade Fe-415. Use Limit State Method.	08	2	5	4

**END SEM / RE-EXAM EXAMINATION MAY / JUNE 2025**

2 c	A RCC beam of size 230 x 600 mm overall, is reinforced with 4 bars of 20 mm diameter on tension side and 2 bars of 16 mm diameter on compression side. The beam is simply supported over a span of 6 m. Determine maximum superimposed uniformly distributed load the beam can carry over the entire span. Assume concrete of grade M-20 and steel of grade Fe-500. Use Limit State Method. <table><tr><th colspan="3">Stress Strain relationship for HYSD Steel ($f_{yd}=0.87f_y$)</th></tr><tr><th>Stress Level</th><th colspan="2">Total Strain</th></tr><tr><th>$F_{yd} = 0.87f_y$</th><th>Fe415</th><th>Fe500</th></tr><tr><td>0.80 f_{yd}</td><td>0.00144</td><td>0.00174</td></tr><tr><td>0.85 f_{yd}</td><td>0.00163</td><td>0.00195</td></tr><tr><td>0.90 f_{yd}</td><td>0.00192</td><td>0.00226</td></tr><tr><td>0.95 f_{yd}</td><td>0.00241</td><td>0.00277</td></tr><tr><td>0.975 f_{yd}</td><td>0.00276</td><td>0.00312</td></tr><tr><td>1.00 f_{yd}</td><td>0.00380</td><td>0.00417</td></tr></table>	Stress Strain relationship for HYSD Steel ($f_{yd}=0.87f_y$)			Stress Level	Total Strain		$F_{yd} = 0.87f_y$	Fe415	Fe500	0.80 f_{yd}	0.00144	0.00174	0.85 f_{yd}	0.00163	0.00195	0.90 f_{yd}	0.00192	0.00226	0.95 f_{yd}	0.00241	0.00277	0.975 f_{yd}	0.00276	0.00312	1.00 f_{yd}	0.00380	0.00417	08	2	4	4
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3 a	Determine moment carrying capacity of a T Beam having following properties: Width of flange = 1800 mm, Depth of the flange = 120 mm Width of web = 300 mm, Overall depth of the beam = 600 mm Area of reinforcement = 6 bars of 25 mm diameter in two layers on tension side Consider concrete and steel grade as M-20 and Fe-415. Use Limit State Method.	10	2	4	4																											
3 b	A RCC Beam of size 300 mm wide and 600 mm over depth carries a designed factored load of 45 kN/m over a simply supported span of 6 m. The beam is reinforced with 5 bars of 25 mm diameter on tension side. Design the shear reinforcement for the beam assuming 1 bar of 25 mm diameter is bent up @ 45 degrees near the support. Consider concrete and steel grade as M-20 and Fe-415. Use Limit State Method.	10	2,3	5	4																											
4 a	A RCC Column has an unsupported length of 2.6 m. The column is effectively held in position at both ends and restrained against rotation at one end only. The column carries a factored axial compressive load of 1500 kN. And a factored moment of 200 kN-m about minor axis of the column. Design the column considering concrete and steel grade as M-20 and Fe-415. Use Limit State Method. Note that one side of the column is restricted to 230 mm.	10	2,3	5	6																											

**END SEM / RE-EXAM EXAMINATION MAY / JUNE 2025**

4 b	A beam is to be designed for a factored bending moment of 100 kN-m, factored shear force of 80 kN and a factored torsional moment of 40 kN-m. Using cross section of the beam as 300 x 600 mm overall, determine area of tension reinforcement and shear reinforcement. Consider concrete and steel grade as M-20 and Fe-415. Use Limit State Method.	10	2,3	5	4
5 a	A RCC Column has an unsupported length of 3.0 m. the column is effectively held in position and restrained against rotations at both ends. The column has a cross section of 600 mm x 600 mm and is reinforced with 16 bars of 25b mm diameter as longitudinal steel. Determine the axial load carrying capacity of the column considering concrete and steel grade as M-20 and Fe-415. Use Limit State Method.	08	2,3	4	6
5 b	A slab type combined footing supports two columns A & B having c/c distance of 3 m. Column A has a size of 450 mm x 450 mm and carries a factored load of 1500 kN. Column B has a size of 600 mm x 600 mm and carries a factored load of 2250 kN. Determine the area of the footing required if external face of column A is exactly on the boundary line and column B is internal column. SBC of soil is 250 kN/m ² . Also check the depth of the slab for punching shear and design the foundation for longitudinal bending only. Consider concrete grade as M-20 and steel grade as Fe-415. Use Limit State Method. (Note that design of foundation for transverse bending and one way shear in longitudinal and transverse direction is not required.)	12	2,3	5	7
6	Design a simply supported slab over a room size 2.5 m x 6 m measured internally. The slab is resting on beams having 230 mm thick on all four edges. Live load on the slab is 5 kN/m ² and floor finish load is 1.5 kN/m ² . Also sketch the reinforcement details. Consider concrete grade as M-20 and steel grade as Fe-415. Use Limit State Method.	20	2,3	5	5
7	Designed a sloped isolated footing for a square column of size 500 mm X 500 mm carrying an axial compressive load of 4000 kN (Factored). The SBC of soil is 400 kN/m ² . Also sketch the reinforcement details. Consider concrete grade as M-20 and steel grade as Fe-415. Use Limit State Method.	20	2,3	5	7

Chart 31 COMPRESSION WITH BENDING — Rectangular
Section — Reinforcement Distributed Equally on Two Sides

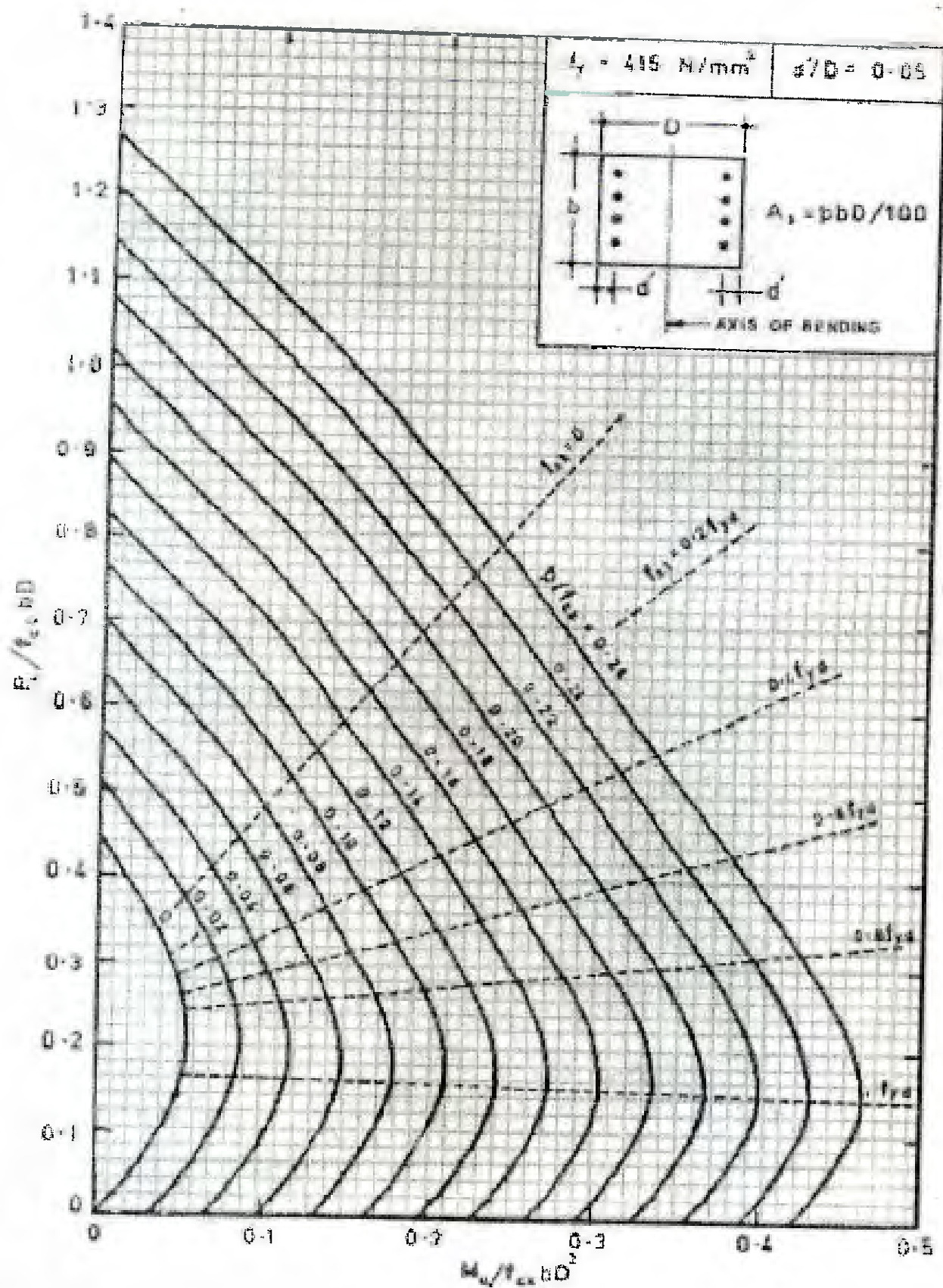


Chart 32 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides

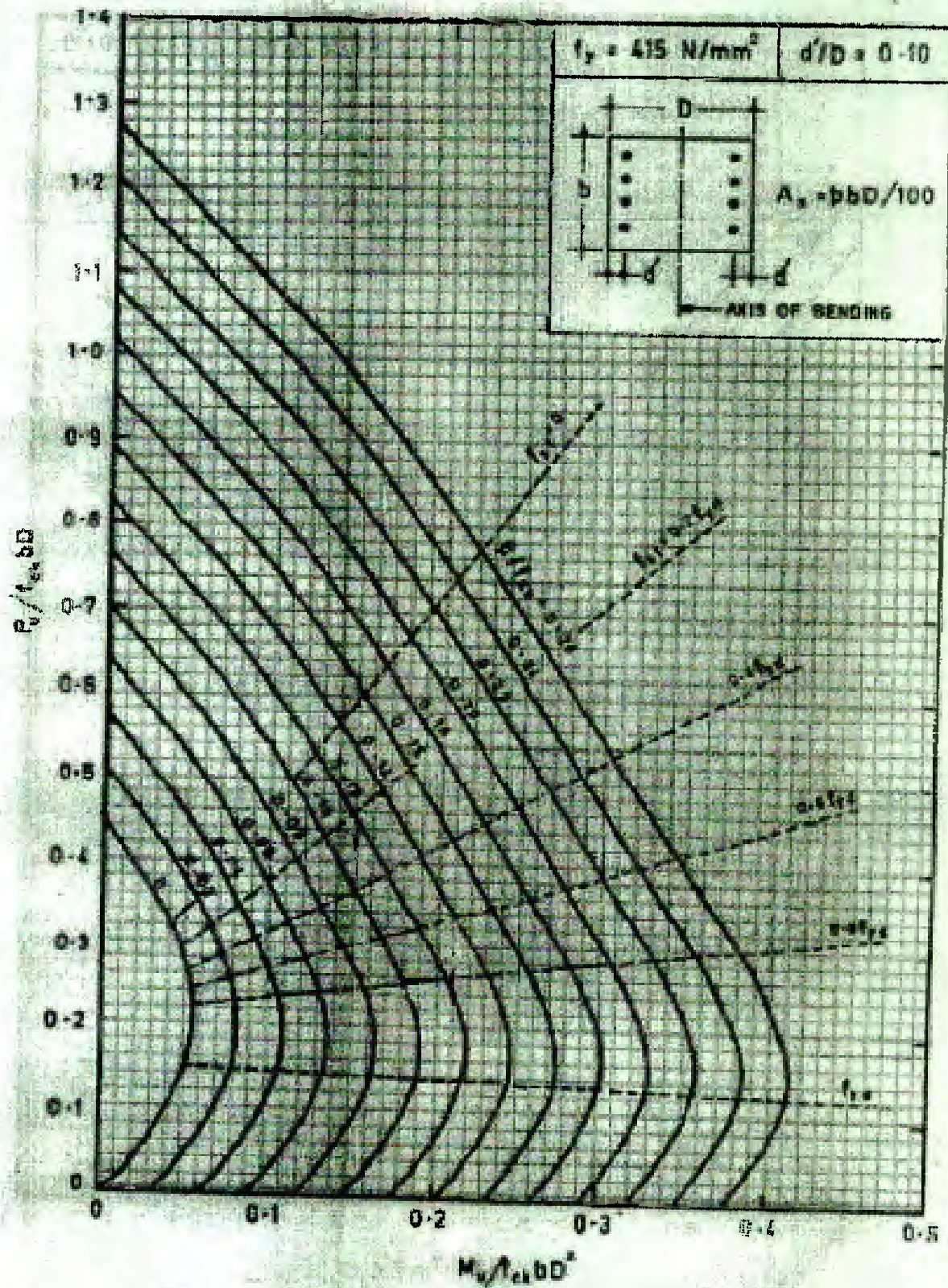


Chart 33 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides

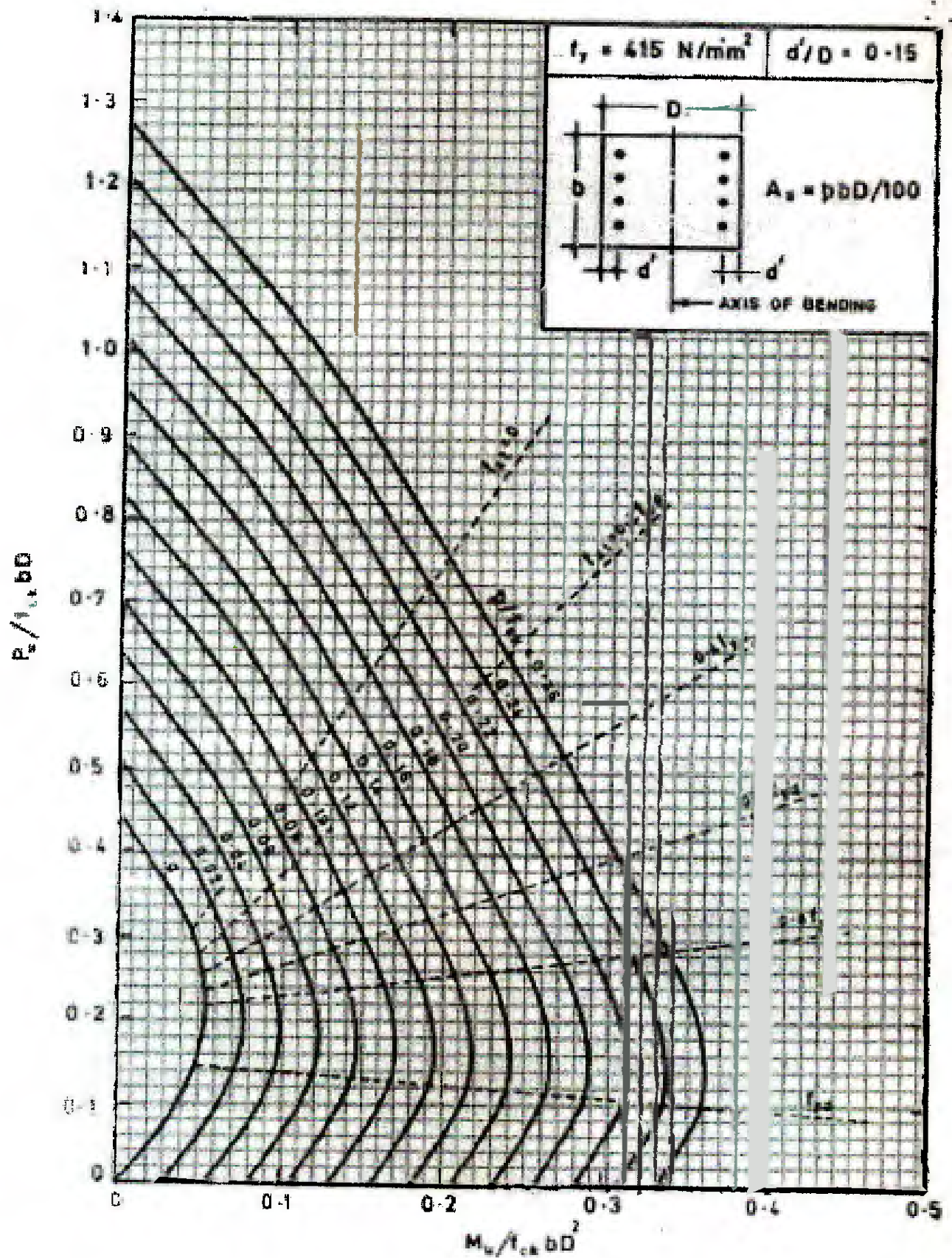


Chart 34 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides

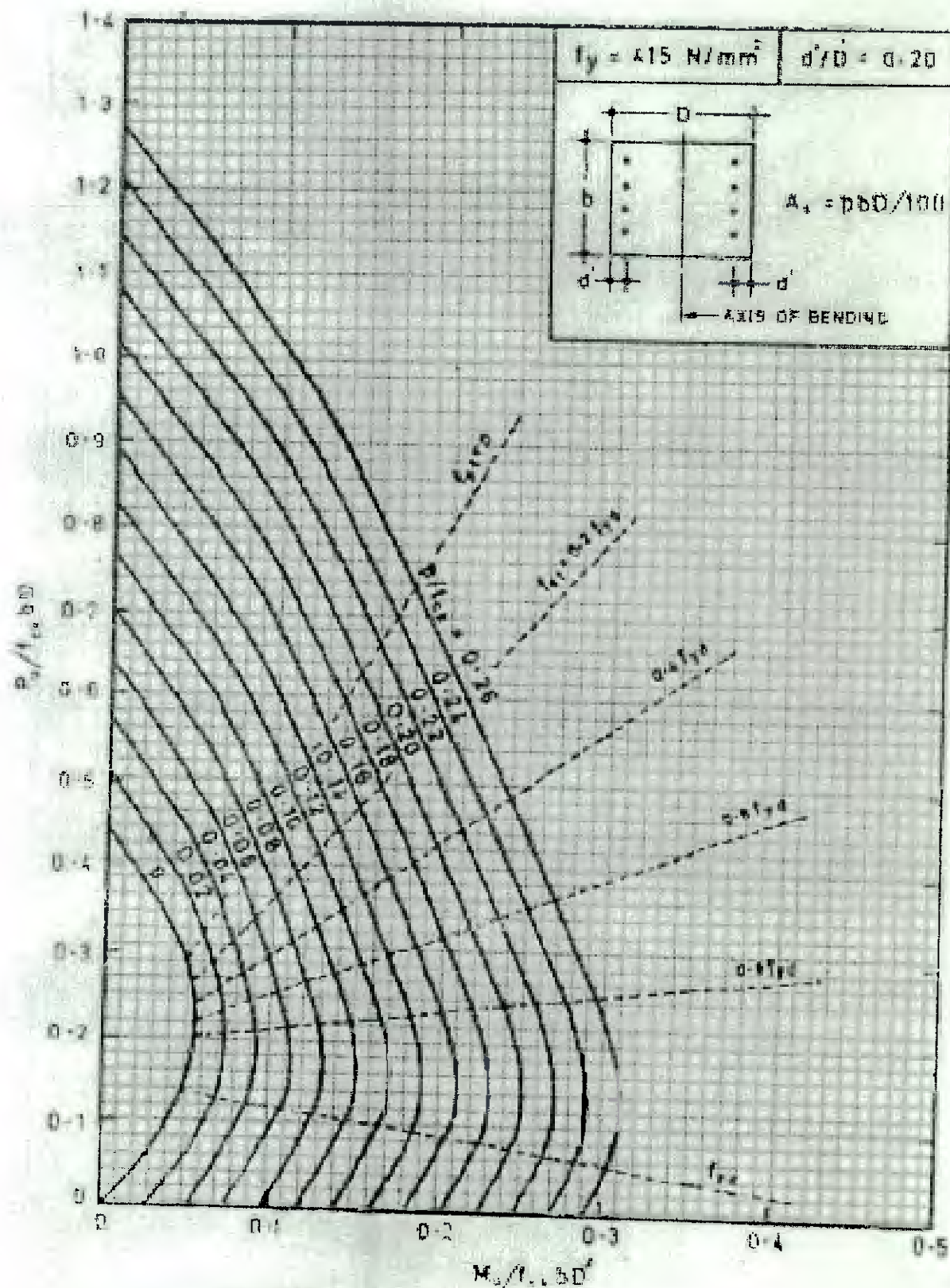


Chart 43 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Four Sides

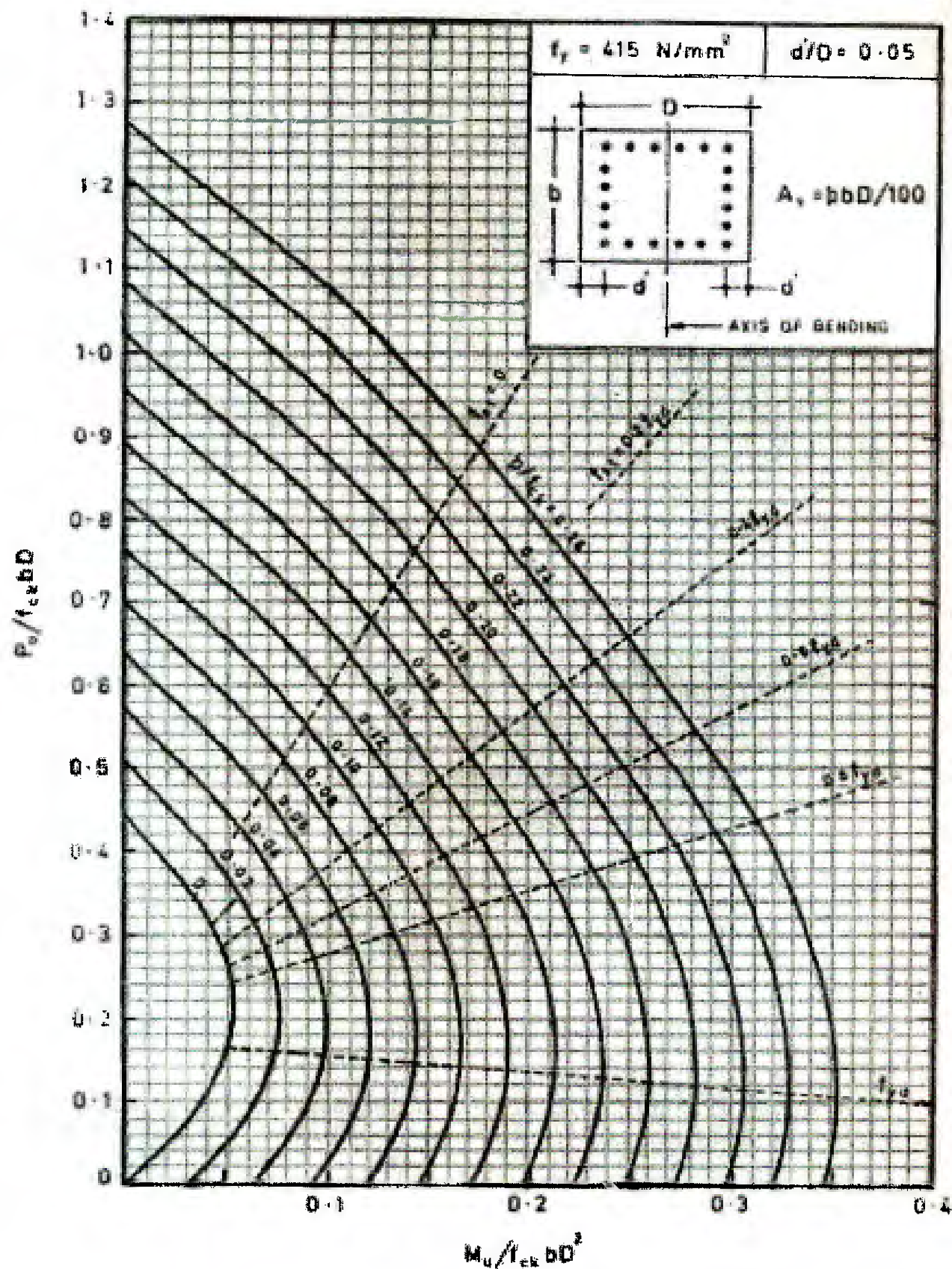


Chart 44 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Four Sides

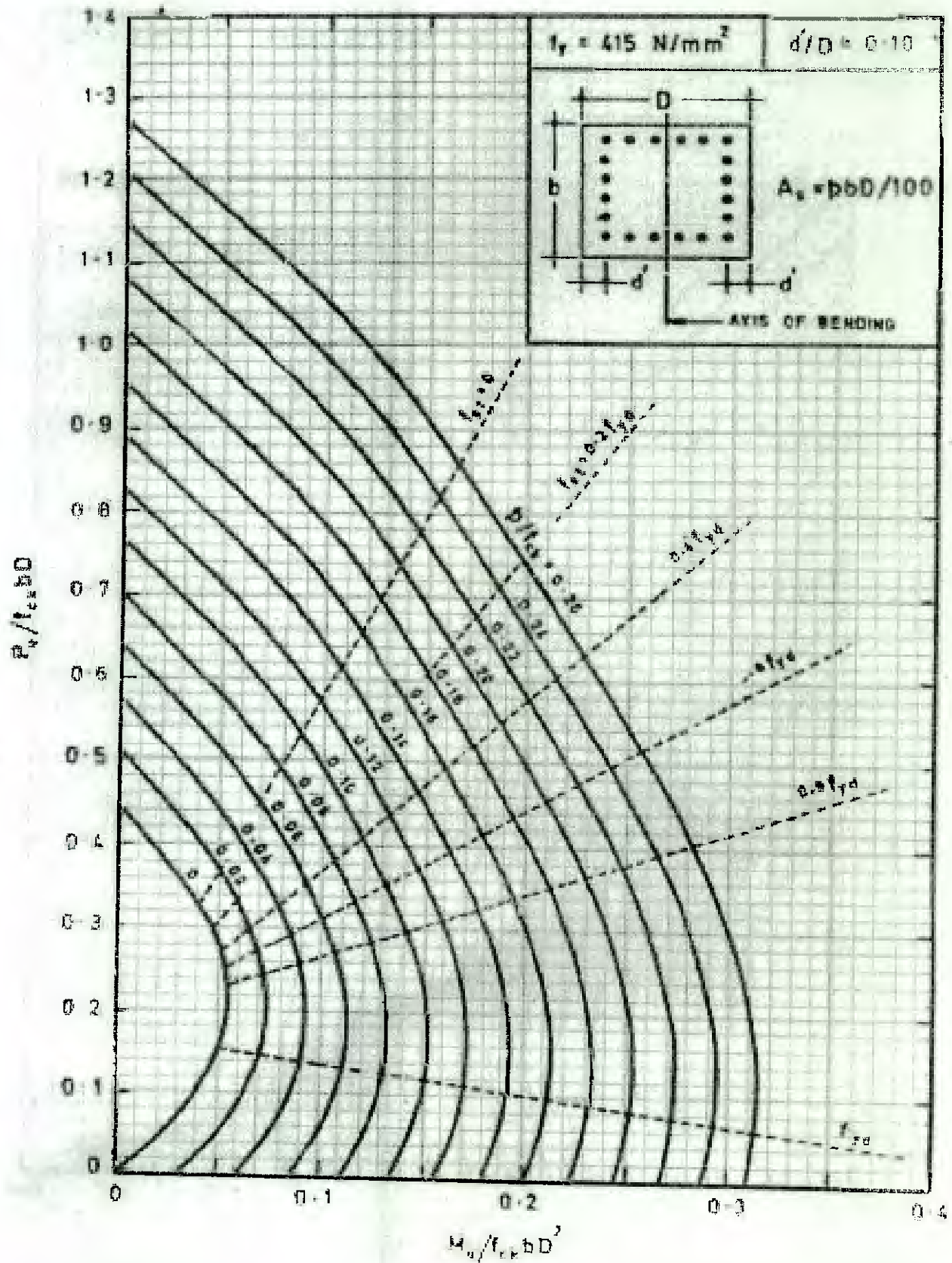
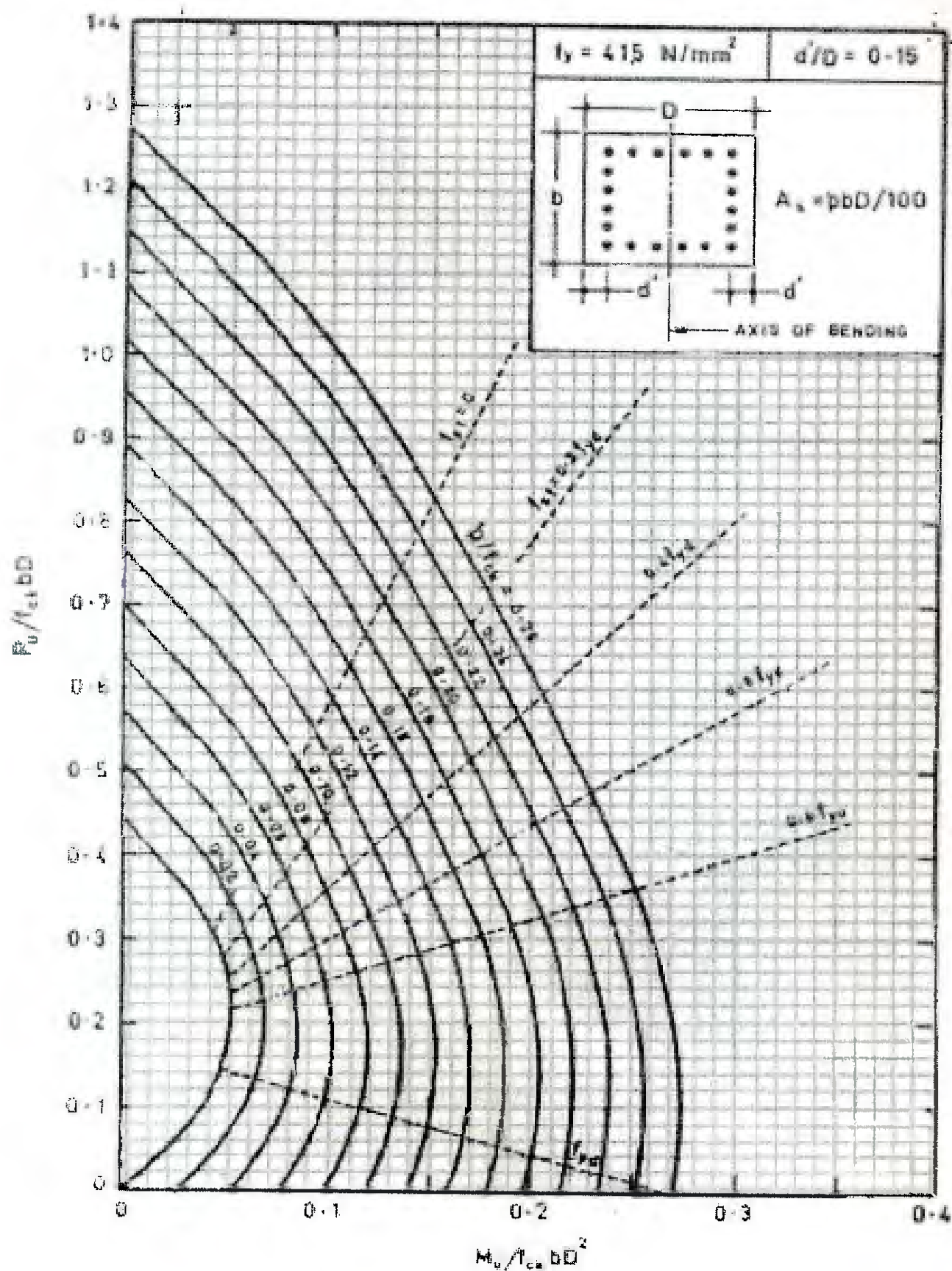


Chart 45 COMPRESSION WITH BENDING — Rectangular
Section — Reinforcement Distributed Equally on Four Sides



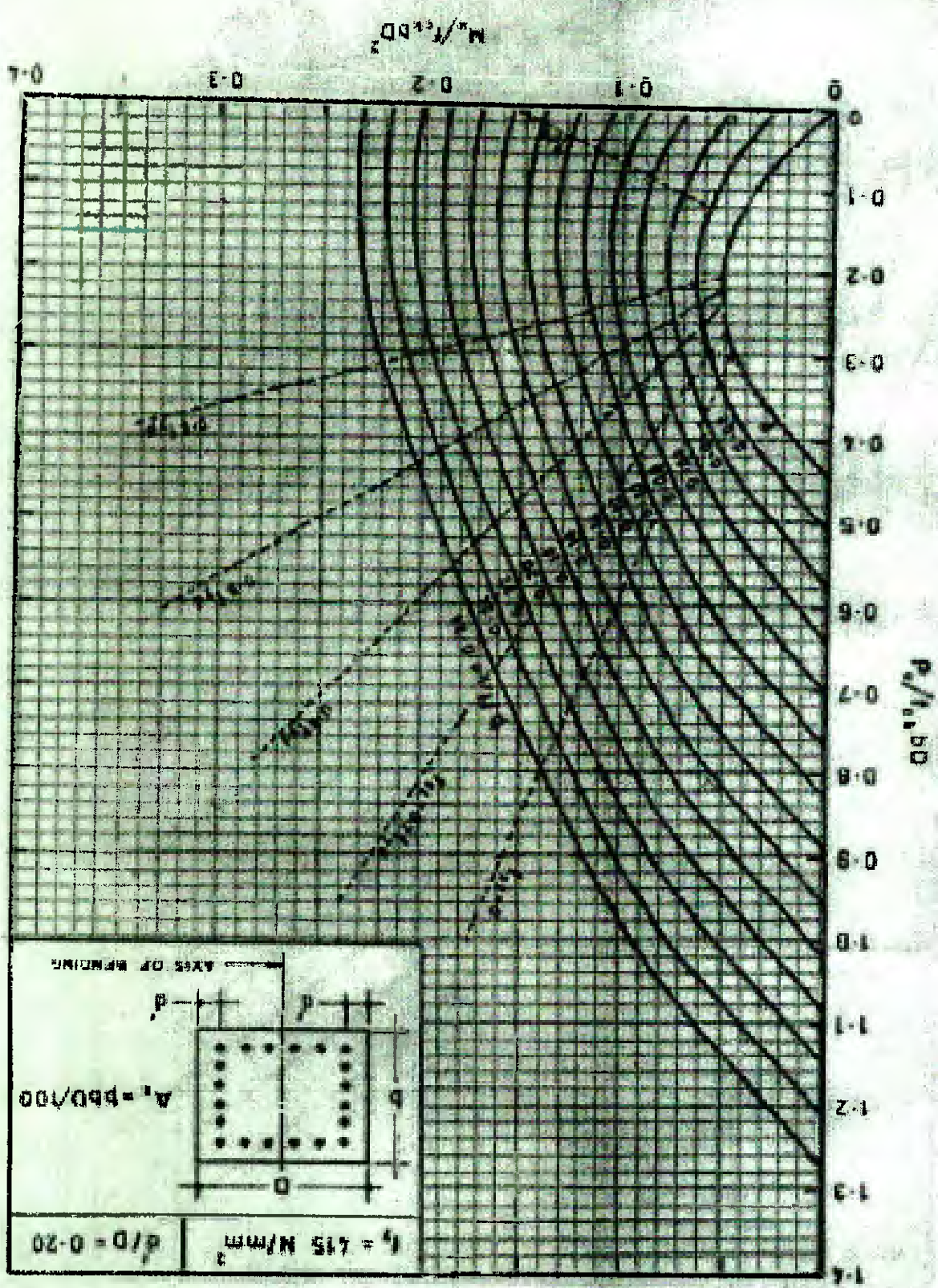


Chart 46 COMPRESSION WITH BENDING—Rectangular Section—Reinforcement Distributed Equally on Four Sides

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**END SEM / RE-EXAM EXAMINATION MAY / JUNE 2025**Program: T.Y. B. Tech *Sum VI*

Duration: 3 Hrs.

Course Code: PC-BTC604

Maximum Points: 100

Course Name: Design of RCC ElementsSemester: VI**Instructions for the Students:**

1. Attempt any 05 (FIVE) questions
 2. Assume suitable data if necessary and state it clearly.
 3. Illustrate your answers with neat sketches wherever required.
 4. Use of IS 456 – 2000 is permitted in examination.
- 21/5/25*

Q. No.	Questions	Points	CO	BL	Module No.
1 a	Explain balanced, under-reinforced and over-reinforced section in design of RCC structures using working stress method.	04	1	2	1
1 b	A RCC beam of size 230 x 600 mm overall, is subjected to superimposed load of 20 kN/m over a simply supported span of 4 m. Determine area of tension steel required. Assume concrete of grade M-20 and steel of grade Fe-415. Use Working Stress Method.	08	1	5	2
1 c	A RCC beam of size 230 x 600 mm overall, is subjected to a moment of 120 kN-m. Design a balanced doubly reinforced section. Assume concrete of grade M-20 and steel of grade Fe-415. Use Working Stress Method.	08	1	5	2
2 a	Explain stress block parameters for concrete in in limit state method of design. Also determine the design constants for concrete grade M-30 and Fe-500.	04	1	2	3
2 b	Determine moment carrying capacity of the beam of size 230 x 600 mm overall reinforced with 4 bars of 12 mm diameter. Assume concrete of grade M-20 and steel of grade Fe-415. Use Limit State Method.	08	2	4	4



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END SEM / RE-EXAM EXAMINATION MAY / JUNE 2025

2 c	A RCC beam of size 300 x 750 mm overall, is reinforced with 4 bars of 25 mm diameter on tension side and 2 bars of 20 mm diameter on compression side. The beam is simply supported over a span of 8 m. Determine maximum superimposed uniformly distributed load the beam can carry over the entire span. Assume concrete of grade M-20 and steel of grade Fe-415. Use Limit State Method. <table><tr><th colspan="3">Stress Strain relationship for HYSD Steel ($f_{yd}=0.87f_y$)</th></tr><tr><th>Stress Level</th><th colspan="2">Total Strain</th></tr><tr><th>$F_{yd} = 0.87f_y$</th><th>Fe415</th><th>Fe500</th></tr><tr><td>0.80 f_{yd}</td><td>0.00144</td><td>0.00174</td></tr><tr><td>0.85 f_{yd}</td><td>0.00163</td><td>0.00195</td></tr><tr><td>0.90 f_{yd}</td><td>0.00192</td><td>0.00226</td></tr><tr><td>0.95 f_{yd}</td><td>0.00241</td><td>0.00277</td></tr><tr><td>0.975 f_{yd}</td><td>0.00276</td><td>0.00312</td></tr><tr><td>1.00 f_{yd}</td><td>0.00380</td><td>0.00417</td></tr></table>	Stress Strain relationship for HYSD Steel ($f_{yd}=0.87f_y$)			Stress Level	Total Strain		$F_{yd} = 0.87f_y$	Fe415	Fe500	0.80 f_{yd}	0.00144	0.00174	0.85 f_{yd}	0.00163	0.00195	0.90 f_{yd}	0.00192	0.00226	0.95 f_{yd}	0.00241	0.00277	0.975 f_{yd}	0.00276	0.00312	1.00 f_{yd}	0.00380	0.00417	08	2	4	4
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3 a	Determine Area of steel required for a 'T' beam to resist a factored bending moment of 500 kN-m. The properties of 'T' Beams are as follows: Width of flange = 2100 mm, Depth of the flange = 150 mm Width of web = 300 mm, Effective depth of the beam = 600 mm Consider concrete and steel grade as M-20 and Fe-415. Use Limit State Method.	10	2	5	4																											
3 b	A RCC Beam of size 300 mm wide and 600 mm over depth carries a designed factored load of 45 kN/m over a simply supported span of 6 m. The beam is reinforced with 5 bars of 25 mm diameter on tension side. Design the shear reinforcement for the beam assuming vertical stirrups only. Consider concrete and steel grade as M-20 and Fe-415. Use Limit State Method.	10	2,3	5	4																											
4 a	A RCC Column has an unsupported length of 3.0 m. The column is effectively held in position at both ends and not restrained against rotations. The column carries a factored axial compressive load of 2000 kN and a factored moment of 200 kN-m about minor axis of the column. Design the column considering concrete and steel grade as M-20 and Fe-415. Use Limit State Method. Note that one side of the column is restricted to 300 mm.	10	2,3	5	6																											

**END SEM / RE-EXAM EXAMINATION MAY / JUNE 2025**

4 b	A beam is to be designed for a factored bending moment of 180 kN-m, factored shear force of 100 kN and a factored torsional moment of 60 kN-m. Using cross section of the beam as 300 x 750 mm overall, determine area of tension reinforcement and shear reinforcement. Consider concrete and steel grade as M-20 and Fe-415. Use Limit State Method.	10	2,3	5	4
5 a	A RCC Column has an unsupported length of 3.0 m. the column is effectively held in position and restrained against rotations at both ends. The column has a cross section of 600 mm diameter and is reinforced with 12 bars of 25 mm diameter as longitudinal steel. Determine the axial load carrying capacity of the column considering concrete and steel grade as M-20 and Fe-415. Use Limit State Method.	08	2,3	4	6
5 b	A slab type combined footing supports two columns A & B having c/c distance of 4 m. Column A has a size of 450 mm x 450 mm and carries a factored load of 1800 kN. Column B has a size of 600 mm x 600 mm and carries a factored load of 3600 kN. Maximum width of the footing available is 2.5 m. SBC of soil is 250 kN/m ² . Also check the depth of the slab for punching shear and design the foundation for longitudinal bending only. Consider concrete grade as M-20 and steel grade as Fe-415. Use Limit State Method. (Note that design of foundation for transverse bending and one way shear in longitudinal and transverse direction is not required.)	12	2,3	5	7
6	Design a simply supported slab over a room size 2.5 m x 3.5 m measured internally. The slab is resting on beams having 230 mm thick on all four edges. Live load on the slab is 3 kN/m ² and floor finish load is 1 kN/m ² . Also sketch the reinforcement details. Consider concrete grade as M-20 and steel grade as Fe-415. Use Limit State Method.	20	2,3	5	5
7	Designed a isolated pad footing for a column of size 300 mm X 900 mm carrying an axial compressive load of 2500 kN (Factored load). The SBC of soil is 250 kN/m ² . Also sketch the reinforcement details. Consider concrete grade as M-20 and steel grade as Fe-415. Use Limit State Method.	20	2,3	5	7

Chart 31 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides

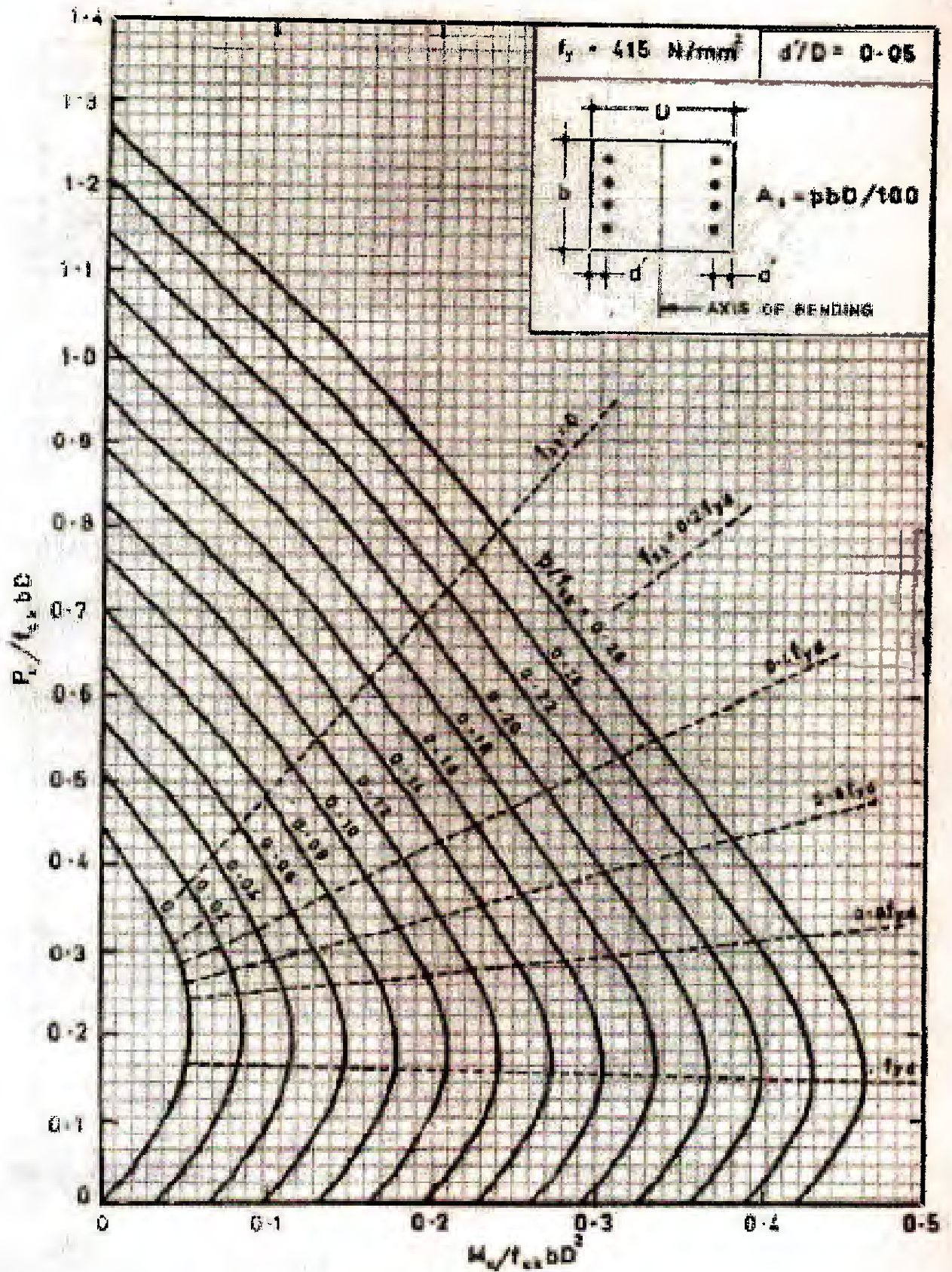


Chart 32 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides

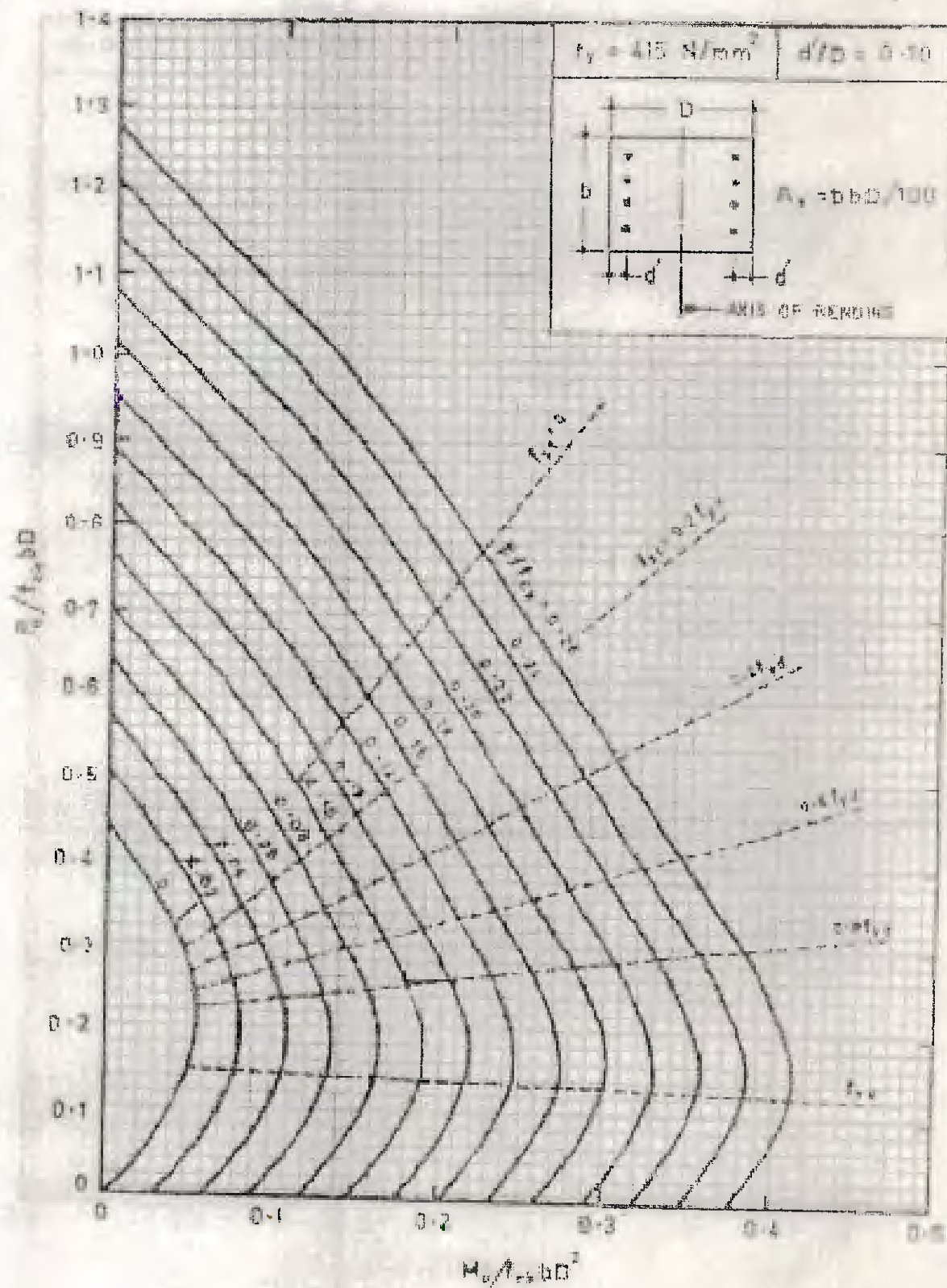


Chart 33 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides

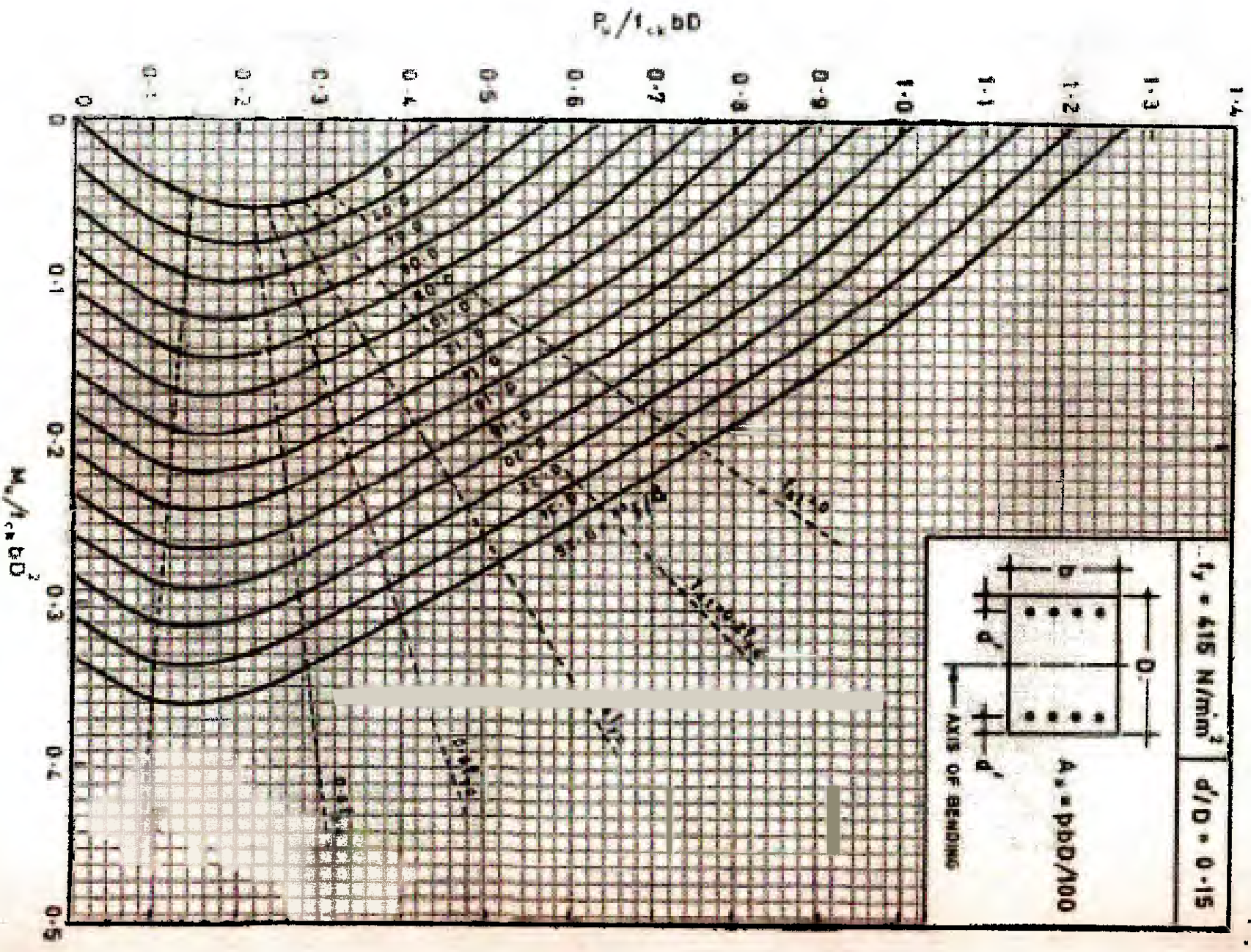


Chart 34 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides

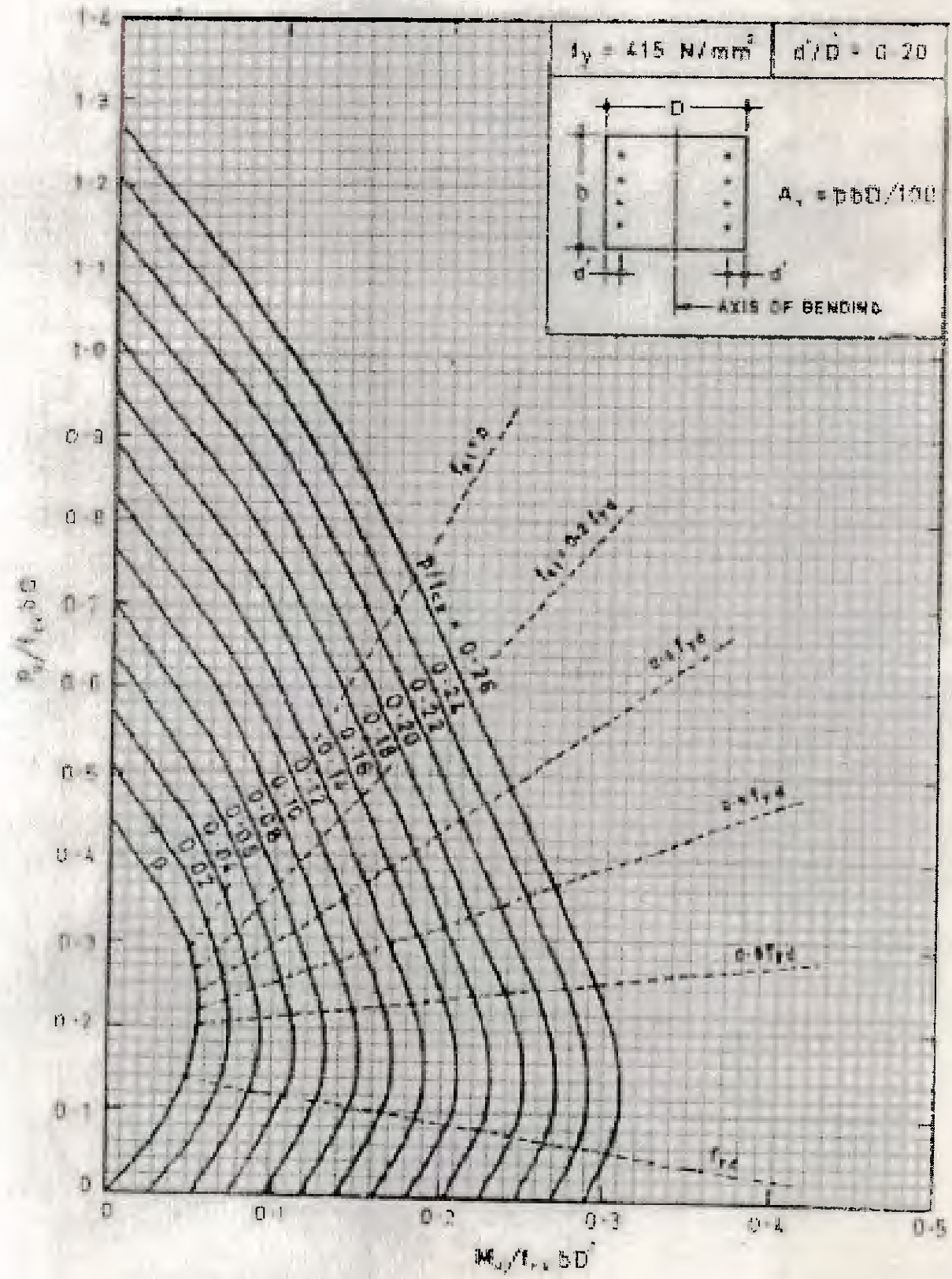


Chart 43 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Four Sides

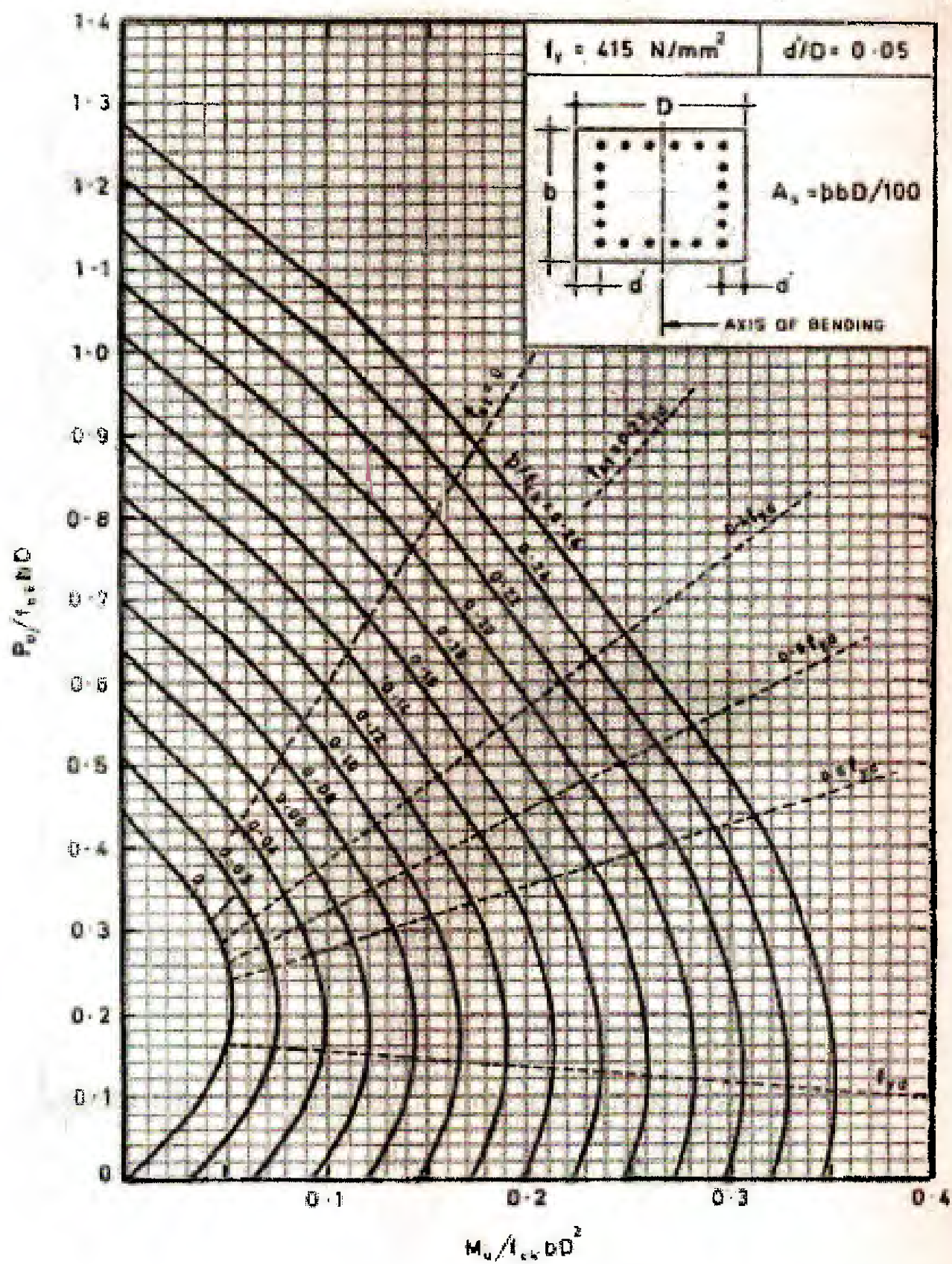


Chart 44 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Four Sides

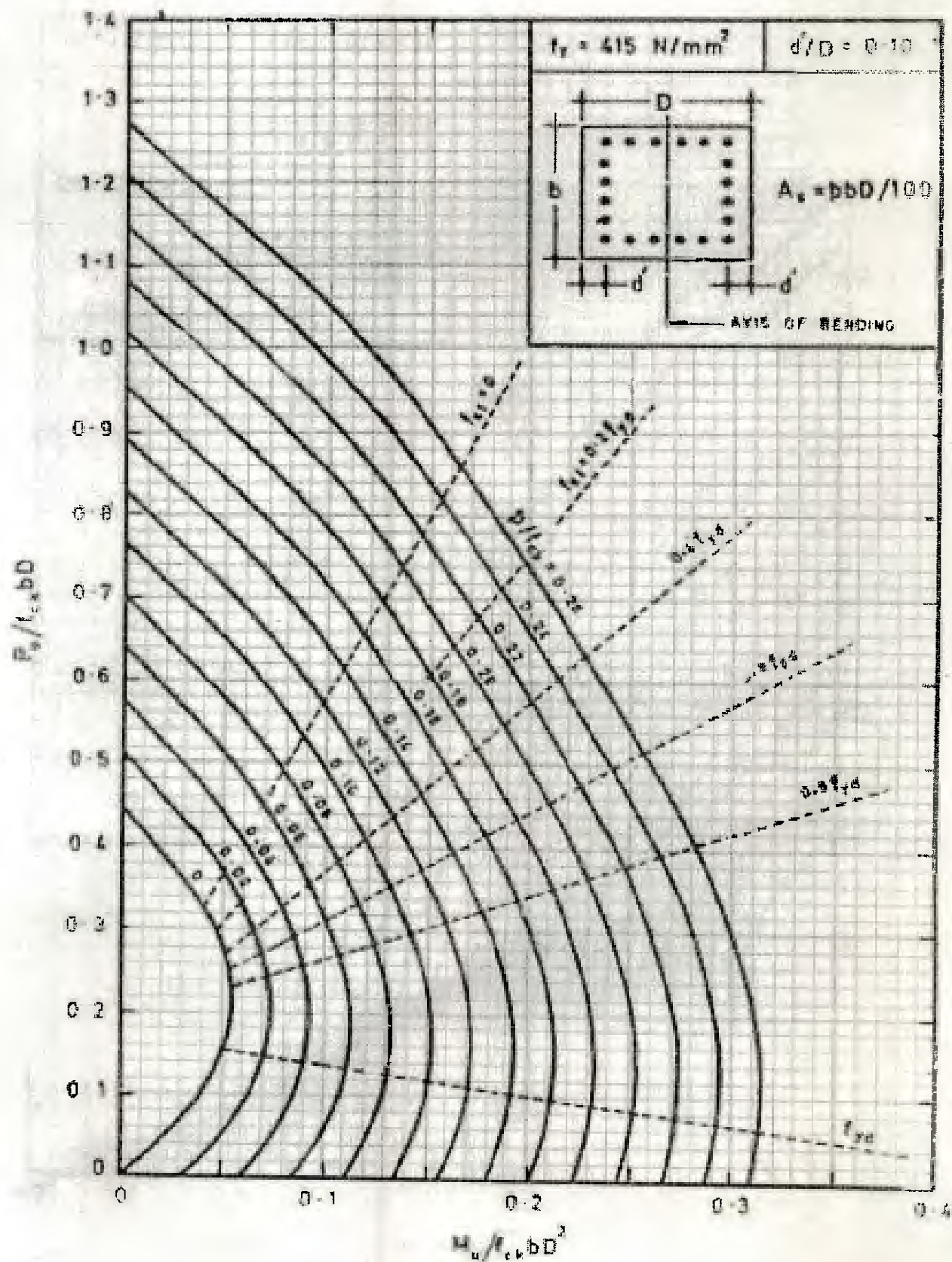


Chart 45 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Four Sides

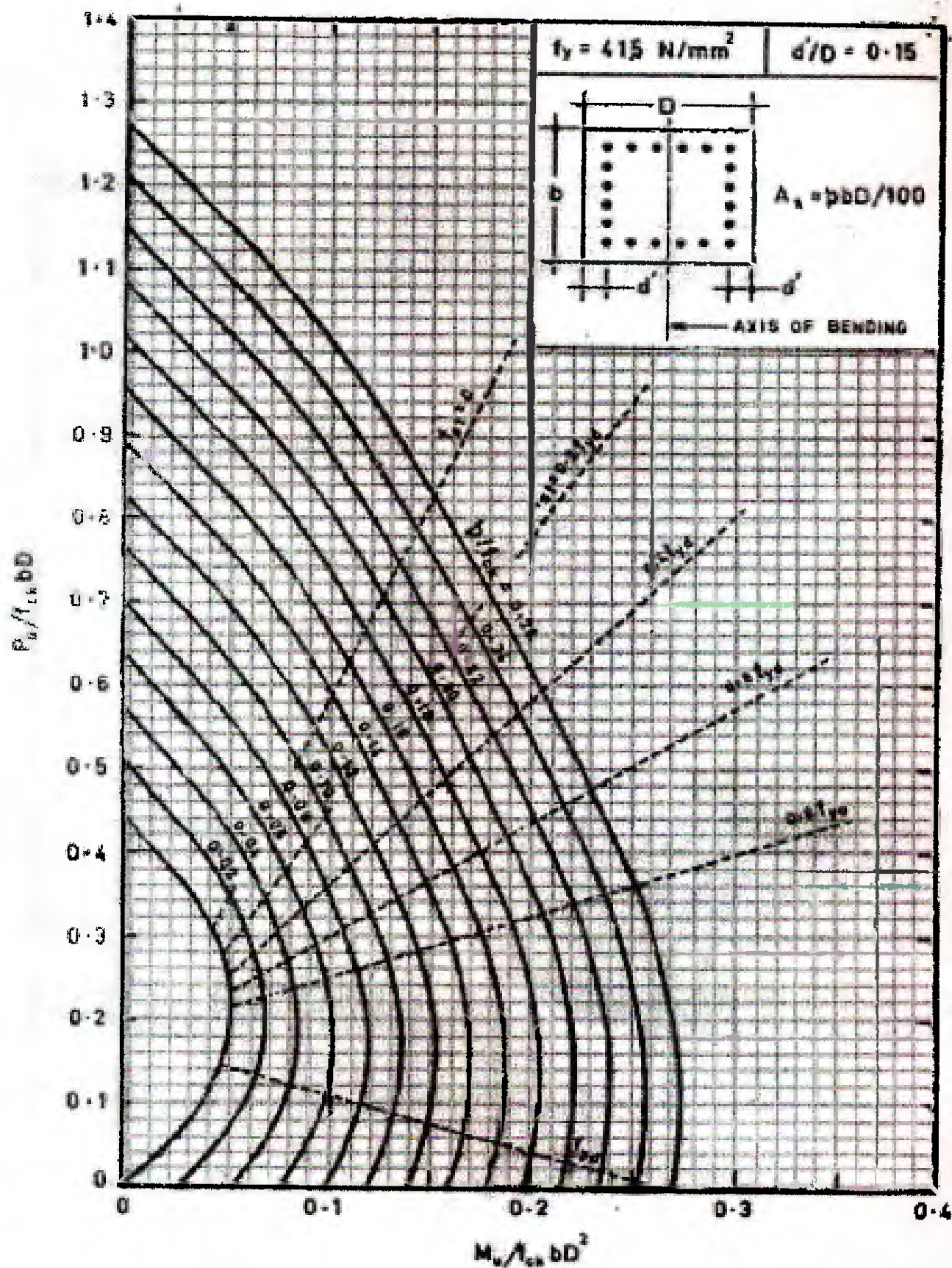
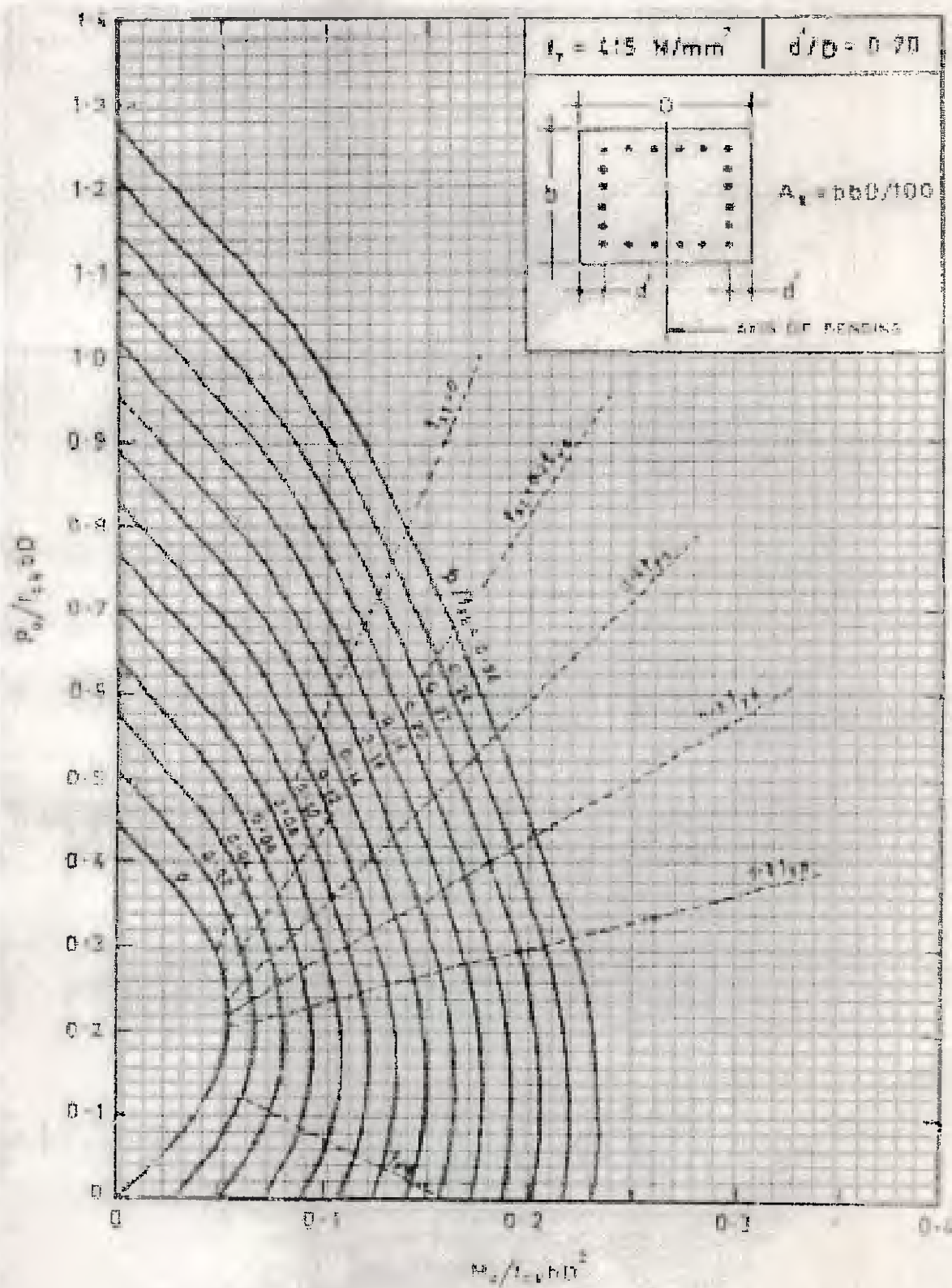


Chart 46 COMPRESSION WITH BENDING — Rectangular
Section — Reinforcement Distributed Equally on Four Sides





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END-SEMESTER/RE- EXAMINATION: MAY/JUNE 2025

Program: **B.Tech. in Civil Engineering**

Course Code: **PE-BTC621**

Course Name: **Analysis of Indeterminate Structures**

Duration: **3 Hours**

Maximum Points: **100**

Semester: **VI**

1. Attempt any FIVE questions out of SEVEN questions.
2. Answers to all sub questions should be grouped together.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary and state the same clearly.

30/11/25

Q.No	Questions	Points	CO	BL	Module
Q1(a)	Using flexibility method, find the horizontal reaction at D for the frame loaded as shown in figure below.	10	1	3,4	1
Q1(b)	Find the force in the redundant member AC of the truss loaded as shown in figure below by flexibility (compatibility) method. (Take force in member AC as the redundant force.) Assume AE to be same for all the members.	10	1	3,4	1
Q2(a)	Analyse the continuous beam shown in figure using three moment theorem and find the support moments.	12	1	4	2



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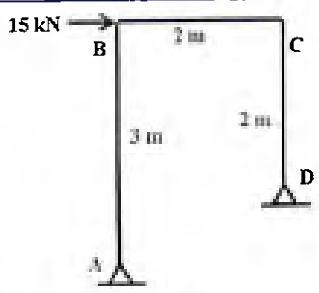
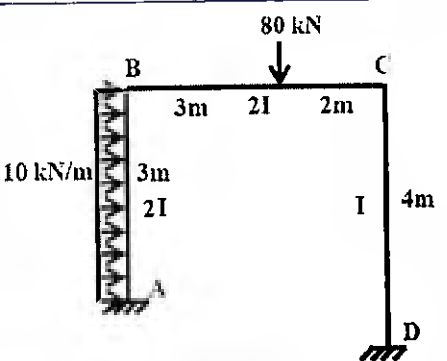
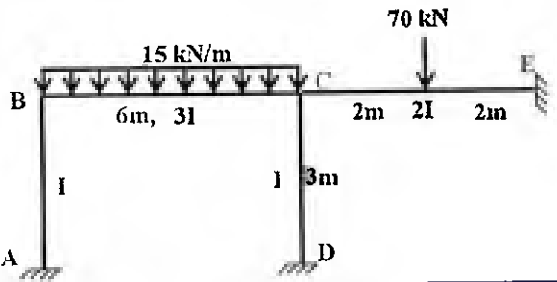
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END SEMESTER/RE- EXAMINATION: MAY/JUNE 2025

Q2(b)	A two hinged parabolic arch of span 30 m and rise 5 m carries a concentrated load of 12 kN at a distance of 10 m from the left support. Determine the horizontal thrust in the arch. The moment of inertia (MI) of the section of the arch varies as $I = I_0 \sec\theta$, where $I_0 = MI$ of the section at the crown.	08	1	3,4	2
Q3(a)	Using the theorem of least work, find the horizontal reaction at D for the frame loaded as shown in figure below.	14	1	3,4	3
					
Q3(b)	Define flexibility coefficient f_{ij} and state the important properties of the flexibility matrix	06	1	3,4	1
Q4	Using slope deflection method, find the unknown displacements and end moments for the frame loaded as shown in the figure below.	20	2	3,4	4
					
Q5(a)	Analyse the the rigid jointed frame loaded as shown in the figure below by moment distribution method and find the end moments.	14	2	3,4	5
					



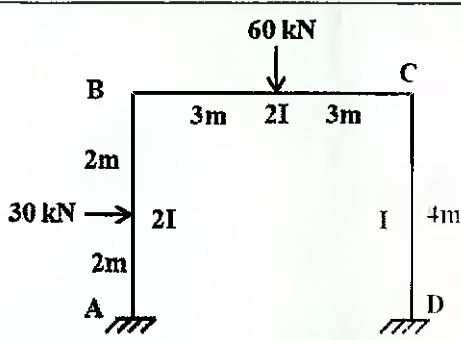
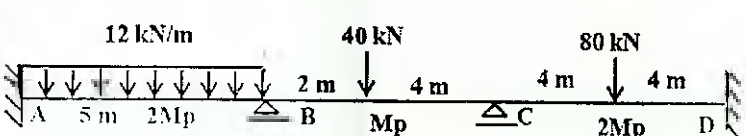
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END-SEMESTER/RE- EXAMINATION: ~~MAY~~/JUNE 2025

Q5(b)	What are the advantages and disadvantages of plastic analysis over elastic analysis?	06	3	1,2	7
Q6(a)	Using stiffness method, find the unknown displacements in the rigid jointed frame loaded as shown in the figure below.	17	2	3,4	6
					
Q6(b)	What are the conditions to be satisfied while analyzing a structure using elastic analysis?	03	1,2	1,2	1 to 7
Q7(a)	Find the shape factor of a T section with the dimensions given below. Width of flange = 250mm, thickness of flange = 20 mm Depth of web = 150mm, thickness of web = 10mm.	08	3	3,4	7
Q7(b)	A continuous beam is subjected to working loads as shown in figure below. If $M_p = 75 \text{ kN-m}$, calculate the (true) load factor for the beam.	12	3	3,4	7
					



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END SEMESTER/~~RE~~ EXAMINATION: MAY/JUNE 2025

Program: B.Tech. in Civil Engineering

Course Code: PE-BTC621

Course Name: Analysis of Indeterminate Structures

Duration: 3 Hours

Maximum Points: 100

Semester: VI

1. Attempt any FIVE questions out of SEVEN questions.
2. Answers to all sub questions should be grouped together.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary and state the same clearly.

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Q.No	Questions	Points	CO	BL	Module
Q1(a)	Using flexibility method, find the reactions at C for the frame loaded as shown in figure below.	10	1	3,4	1
Q1(b)	Find the force in the redundant member AC of the truss loaded as shown in figure below by flexibility (compatibility) method. (Take force in member AC as the redundant force.) Assume AE to be same for all the members.	10	1	3,4	1
Q2(a)	Analyse the continuous beam shown in figure using three moment theorem and find the support moments.	12	1	4	2



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END SEMESTER/~~1st~~ EXAMINATION: MAY/JUNE 2025

Q2(b)	A two hinged parabolic arch has a span of 32 m and a rise of 8 m. An udl of intensity 10 kN/m acts on the arch for a length of 8m starting from the left support. Determine the horizontal thrust in the arch. The moment of inertia (MI) of the section of the arch varies as $I = I_0 \sec \theta$, where I_0 = MI of the section at the crown.	08	1	3,4	2
Q3(a)	Using the theorem of least work, find the reactiona at A for the frame loaded as shown in figure below.	14	1	3,4	3
Q3(b)	State if the method of analysis given below is a Force method or a Displacement method (i) Stiffness method (ii) Slope deflection method (iii) Method of least work (iv) Moment distribution method (v) Flexibility method (vi) Theorem of three moments	06	1	3,4	1
Q4(a)	Using slope deflection method, find the unknown displacements and end moments for the frame loaded as shown in the figure below.	14	2	3,4	4
Q4(b)	Define (as used in moment distribution method) (i) Rotational bending stiffness of a member (ii) Distribution factor (iii) Carry over factor	06	2	3,4	5



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END SEMESTER/~~DE~~ EXAMINATION: MAY/JUNE 2025



Q5	Analyse the the rigid jointed frame loaded as shown in the figure below by moment distribution method and find the end moments.	20	2	3,4	5
Q6(a)	Using stiffness method, find the unknown displacements in the rigid jointed frame loaded as shown in the figure below.	14	2	3,4	6
Q6(b)	Calculate the stiffness coefficients and write the stiffness matrix for the frame shown in figure w.r. to the coordinates indicated in the figure.	06	2	3,4	6



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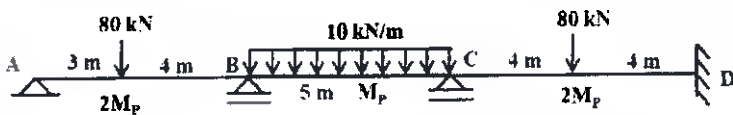
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END SEMESTER/R~~12~~ EXAMINATION: MAY/~~JUNE~~ 2025

Q 7(a)	Find the shape factor for the unsymmetrical I section with the following data. Top flange - width = 150 mm, thickness = 10 mm Bottom flange - width = 200 mm, thickness = 15 mm Depth of web = 180 mm, thickness of web = 12 mm.	10	3	3,4	7
Q 7(b)	A continuous beam is subjected to working loads as shown in figure below. If $M_P = 90$ kN-m, calculate the (true) load factor for the beam.	10	3	3,4	7
					



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~~END SEM~~ RE-EXAM EXAMINATION - ~~MAY~~ / JUNE 2025

T.Y. B.Tech Civil Sum VI

Total points: 100

Duration: Total Time allotted will be 3 Hr.

Class: M.TECH(CM)

Semester: VI

Program: Civil

Name of the Course: Hydraulic Structures & Irrigation Engineering Course Code : PE-BTC631

Instructions:

1. Solve any five out of seven.
2. Assume suitable data if necessary and state the clearly.

20/6/25

Que. No		Points	CO	BL	Module No																								
1	Design the salient dimensions of syphon well drop for the following particulars Fall height..... = 2.5 m General ground level..... = 120 m Full supply depth..... = 1.2 m Bed level upstream..... = 118.50 m Discharge..... = 3.5 cumecs Bed width upstream and downstream = 3.5 m	20	1,2	3	2																								
2	Design suitable cross drainage works, given the following data at the crossing of canal and a drainage. <table><tr><td colspan="2">Canal</td></tr><tr><td>Full supply discharge</td><td>32 cumecs</td></tr><tr><td>Full supply level</td><td>213.5</td></tr><tr><td>Canal bed level</td><td>212</td></tr><tr><td>Canal bed width</td><td>20</td></tr><tr><td colspan="2">Trapezoidal canal section with 1.5H:1V slopes</td></tr><tr><td>Canal water depth</td><td>1.5</td></tr><tr><td colspan="2">Drainage</td></tr><tr><td>High flood discharge</td><td>300 cumecs</td></tr><tr><td>High flood level</td><td>210 m</td></tr><tr><td>High flood depth</td><td>2.5 m</td></tr><tr><td>General ground level</td><td>212.5 m</td></tr></table>	Canal		Full supply discharge	32 cumecs	Full supply level	213.5	Canal bed level	212	Canal bed width	20	Trapezoidal canal section with 1.5H:1V slopes		Canal water depth	1.5	Drainage		High flood discharge	300 cumecs	High flood level	210 m	High flood depth	2.5 m	General ground level	212.5 m	20	1,2	3	5
Canal																													
Full supply discharge	32 cumecs																												
Full supply level	213.5																												
Canal bed level	212																												
Canal bed width	20																												
Trapezoidal canal section with 1.5H:1V slopes																													
Canal water depth	1.5																												
Drainage																													
High flood discharge	300 cumecs																												
High flood level	210 m																												
High flood depth	2.5 m																												
General ground level	212.5 m																												

3	A. Define Following- • Time factor • Capacity factor • Full supply coefficient • Nominal duty • Base period.	10			02
	B. Explain factors on which duty depends?	05			02
	C. Explain different irrigation efficiencies.	05			02
4	A. Design the size and number of notches required for a canal drop with the following particulars: Full supply discharge = 10 m ³ /s Bed width = 5.00 m F.S. depth. = 2 m Half Supply Depth = 1.5 m Also check for raised crest level. Draw the detailed figure of final design.	15	1	3	4
	B. Compare different types of falls.	05	1	1	4
5	A. Explain case study of Narmada Sagar project.	10			07
	B. A civil engineering team is planning to construct an earthen dam across a seasonal river in a valley with the following site conditions: • The foundation consists of stable rock with low permeability. • There is an abundant supply of both impervious clay and pervious gravel/sand locally available. • The area experiences moderate to heavy rainfall, and water seepage control is critical due to nearby agricultural land. • Construction costs need to be optimized, but long-term stability and seepage resistance are top priorities. Given these conditions, which type of earthen dam is most suitable, and why? Options: A. Homogeneous Earthen Dam B. Zoned Earthen Dam C. Diaphragm Earthen Dam	10			01

	D. Hydraulic Fill Dam				
6	A. Give significance of pore water pressure in design of earthen dams.	10			06
	B. In design consideration of dams how various kinds of densities and their relations considered.	10			06
7	How Khosla's theory is applicable in designing critical exit gradient and safe exit gradient, also explain Khosla's flow net.	20			03



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END SEM/RE-EXAM EXAMINATION -MAY / JUNE 2025



Total points: 100

Duration: Total Time allotted will be 3 Hr

Class: **M.TECH(CM).**

Semester: VI

Program: Civil

Name of the Course: **Hydraulic Structures & Irrigation Engineering** Course Code : **PE-BTC631**

Instructions:

1. Solve any five out of seven.
2. Assume suitable data if necessary and state the clearly.

19172

Que. No		Points	CO	BL	Module No
1	A. Design the size and number of notches required for a canal drop with the following particulars: Full supply discharge = $0.12 \text{ m}^3/\text{s}$ Bed width = 1.00 m F.S. depth. = 0.75 m Half Supply Depth = 0.375 m Also check for raised crest level. Draw the detailed figure of final design. B. In case of branch canals and distributary channels how canal falls are located.	15 05	1 1	3 1	4 4
2	Design the salient dimensions of syphon well drop for the following particulars Fall height.....= 5 m General ground level.....= 150 m Full supply depth.....= 1 m Bed level upstream.....= 149.50 m Discharge.....= 2 cumecs Bed width upstream and downstream = 3 m	20	1,2	3	2
3	A. Define Following- 1. Gross command area 2. Cultivable command area 3. Intensity of irrigation 4. Net and gross irrigated areas	10	1,2	1	2

	5. Area to be irrigated B. What are the factors that must be considered for deciding an ideal cropping pattern in a given are, explain with example in detail? C. What are the requirements for success of an irrigation project? How an irrigation project Plan?	05			2																						
		05			2																						
4	Design suitable cross drainage works, given the following data at the crossing of canal and a drainage. Design up to trough dimensions. <table><tr><td colspan="2">Canal</td></tr><tr><td>Full supply discharge</td><td>40 cumecs</td></tr><tr><td>Full supply depth</td><td>1.6 m</td></tr><tr><td>Canal bed level</td><td>206.4</td></tr><tr><td>Canal bed width</td><td>30 m</td></tr><tr><td colspan="2">Trapezoidal canal section with 1.5H:1V slopes</td></tr><tr><td colspan="2">Drainage</td></tr><tr><td>High flood discharge</td><td>450 cumecs</td></tr><tr><td>High flood level</td><td>207 m</td></tr><tr><td>Bed level of drainage</td><td>204.5 m</td></tr><tr><td>General ground level</td><td>206.5 m</td></tr></table>	Canal		Full supply discharge	40 cumecs	Full supply depth	1.6 m	Canal bed level	206.4	Canal bed width	30 m	Trapezoidal canal section with 1.5H:1V slopes		Drainage		High flood discharge	450 cumecs	High flood level	207 m	Bed level of drainage	204.5 m	General ground level	206.5 m	20	1,2	03	06
Canal																											
Full supply discharge	40 cumecs																										
Full supply depth	1.6 m																										
Canal bed level	206.4																										
Canal bed width	30 m																										
Trapezoidal canal section with 1.5H:1V slopes																											
Drainage																											
High flood discharge	450 cumecs																										
High flood level	207 m																										
Bed level of drainage	204.5 m																										
General ground level	206.5 m																										
5	A. Elaborate case study of Bhakra-Nanagal dam. B. How rock filled dam method has become superior over other method of construction of dam, explain in detail.	10			07																						
		10			06																						
6	A. A canal is being constructed in a region with undulating terrain. During the alignment survey, it is found that a natural stream (nallah) crosses the proposed canal route at a lower elevation than the canal bed level. The canal must maintain its designed slope and discharge without allowing water from the stream to enter the canal. Considering hydraulic efficiency, safety, and economy, which type of cross drainage work should be adopted at the crossing point, and why? Options: A. Aqueduct	10			05																						

	B. Superpassage C. Level Crossing D. Canal Siphon (Inverted Siphon)	05			01
	B. Criteria's for selection of dam site for gravity dam. C. Technical parameters which contributes in designing of gravity dam.	05			01
7	Explain how Bligh's creep theory is applicable in safety against piping and safety against uplift pressure	20			03



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SET I

RE/ ~~END~~ SEMESTER EXAM - ~~MAY~~ JUNE 2025

Program: Civil Engineering

Duration: 3 hr.

Course Code: PE-BTC 651

Maximum Points: 100

Course Name: SOLID & HAZARDOUS WASTE MANAGEMENT

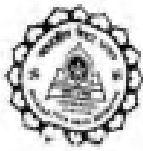
Semester: VI

Notes:

1. Q.1 is compulsory & attempt any four from remaining six
2. Illustrate answer with neat sketches wherever required.
3. Make suitable assumptions where necessary and state them clearly.

30/6/25

Q.No.	Questions	Points	BL	CO	Module
1	Attempt any four: 1. Strategy for waste management. 2. Any five factors affecting the generation rate. 3. Explain any five landfill siting considerations as per MSW, 2016. 4. Effect of Hazardous waste on environment. 5. Stages of Glass waste recycling as per SWM, 2016.	20	1	2,3	1-7
2	A. Calculate the number of collection vehicles a community would need if it has 4000 services (customers) that are to be collected once per week during working days in a Delhi. (Realistically, most trucks can service only about 200 to 300 customers before the truck is full and a trip to the landfill is necessary). B. Discuss the physical composition/characteristics of solid waste. C. Discuss the onsite handling, storage, processing & treatment options/operations of solid waste as per SWM, and 2016.	05+ 05 +10	2	1,2,3	2,3
3	A. Discuss shortly the functional elements of solid waste management. B. Discuss the Sources of solid wastes. C. Define: Transfer station. Also discuss need, types, issues of transfer station as per MSW, 2016	05+ 05 +10	2	1,2,3	3
4	A. Explain screening & compaction as unit operations at processing of solid waste at processing station. B. Discuss the Material Recovery Facility with advantages & issues.	05+ 05 +10	2	1,2,3	4



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	C. Discuss the objectives of Incineration & pyrolysis. Explain the various types of pyrolysis reactor.				
5	A. Discuss the Windrow/agitated pile type of composting. B. Define: Anaerobic Digestion. Explain the stages of Anaerobic Digestion of solid waste in biogas digester. C. Define: Composting. Explain the phases & advantages of composting process of solid waste management.	05+ 05+ 10	2	1,2,3	4,7
6	A. Discuss the various methods of landfill for disposal of solid waste with neat sketch. Also explain advantages & disadvantages of landfill. B. Discuss the factors that influence leachate quality in landfill. (Any five) C. Define: Landfill. Estimate the desired landfill area for a community with population of 35000 assuming the solid waste generation rate is 2.8 kg/capita/day and specific weight of solid waste is 460kg/m ³ . Average depth for compacted solid waste is 5.0 m.	10+ 05+ 05	2	1,2,3	4,7
7	A. Define: Hazardous waste. Discuss the storage site design criteria for storage of hazardous waste as per hazardous waste management rules, 2016. B. Draw a labelling format of hazardous waste on storage container or transport vehicle. C. Make a list of components of CHWTSDF.	10+ 05+ 05	2	2,3	6,7



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SET II

RE/END SEMESTER EXAM - MAY/JUNE 2025

Program: Civil Engineering

Duration: 3 hr.

Course Code: PE-BTC 651

Maximum Points: 100

Course Name: **SOLID & HAZARDOUS WASTE MANAGEMENT**

Semester: VI

Notes:

1. Q.1 is compulsory & attempt any four from remaining six
2. Illustrate answer with neat sketches wherever required.
3. Make suitable assumptions where necessary and state them clearly.

19/5/25

Q.No.	Questions	Points	BL	CO	Module
1	Attempt any four: 1. Make a list of cost components of solid waste collection system. 2. Stationary Container System. 3. Gasification 4. Stages of Anaerobic Digestion. 5. Write a short note on: Sources of hazardous waste. 6. Stages of Plastic waste recycling as per SWM, 2016.	20	1	2,3	1-7
2	A. Solid waste from a MIDC, Taloja is to be collected in large containers, some of which will be used in conjunction with stationary compactors. Based on traffic at similar parks, it is estimated that the average time to drive from the garage to the first container and from the last container to garage each day will be 15 and 20 min, respectively. If the average time required to drive between containers is 6 min (dbc) and the one way distance to the disposal site is 15.5 mi/h for which speed limit is 55 mi/h (88.5 km/h). Assume 8-hour workday, $S=0.133$; $a=0.016$; $b=0.018$; Assume off route factor (W) as 0.15. • Determine the pickup time per trip (in hrs/trip) • Determine the time per trip (in hrs/trip) • Determine the number of trip that can be made per day (in trip/day) • Determine the actual length of the work day (in hours) B. Discuss the causes of generation of solid waste in urban cities. C. Calculate the Moisture & energy content of solid waste sample for the composition given below. Also determine the chemical composition of organic fraction with and without water and Sulphur for given data,	05+ 05 +10	2	1,2,3	2,3



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Component	Wet weight	MC %	% by weight (Dry Basis)					
			C	H	O	N	S	Ash
Food Waste	9	70	48	6.4	37.6	2.6	0.4	5.0
Paper	34	6	43.5	6.0	44	0.3	0.2	6.0
Card Board	6.0	5	44	5.9	44.6	0.3	0.2	5.0
Plastics	7.0	2	60.0	7.2	22.8	-	-	10
Textiles	2	10	55	6.6	31.2	4.6	-	2.5
Rubber	0.5	2	78	10	-	2.0	-	10
Leather	0.5	10	60	8.0	11.6	10	-	10
Yard Waste	18.5	60	47.8	6	38	3.4	0.3	4.5
Wood	2.0	20	49.5	6	42.7	0.2	0.1	1.5

3	A. Define: Solid waste & Solid waste Management. Discuss any four key issues involved in solid waste management. B. Explain any three components of Collection of solid waste. C. Define: Transportation of solid waste. Also discuss requirements for transportations as per MSW, 2016 (any three) and methods along with advantages /disadvantages.	05+ 05 +10	2	1,2,3	3				
4	A. Explain size reduction operations at processing of solid waste at processing station. B. What do you mean by MRF? Discuss the various types of MRF. C. Define: Incineration. Explain objectives & various types of incineration process for solid waste.	05+ 05 +10	2	1,2,3	4				
5	A. Bangalore Method of composting Vs Indore Method composting B. Define: Anaerobic Digestion. Explain the advantages of biogas digester. C. Define: Composting. Explain the factors affecting the composting process of solid waste. Also discuss the advantages of composting process.	05+ 05+ 10	2	1,2,3	4,7				
6	A. Discuss the various components of sanitary landfill with neat sketch. B. Discuss the phases of biological decomposition & chemical reactions in landfills in detail. C. Define: Landfill. Determine the specific weight in a well compacted landfill for solid waste with the characteristics given in the table. Also determine the impact of resource recovery program on landfill area requirement in which 50% of paper & 80% of glass & tin cans area recovered.	05+ 05+ 10	2	1,2,3	4,7				
<table><tr><td>Component</td><td>Typical % by weight</td><td>Specific weight</td><td>Compaction factor</td></tr></table>		Component	Typical % by weight	Specific weight	Compaction factor				
Component	Typical % by weight	Specific weight	Compaction factor						



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			(kg/m ³)				
	Food waste	8	290	0.33			
	Paper	36	87	0.15			
	Cardboard	5	50	0.18			
	Plastic	6	65	0.10			
	Textiles	1	65	0.15			
	Rubber	0.5	130	0.3			
	Leather	0.5	155	0.3			
	Yard waste	19.5	100	0.2			
	Wood	3	223	0.3			
	Glass	6	195	0.4			
	Tin can	6	80	0.15			
	Aluminum	0.5	150	0.15			
	Other metal	3	330	0.3			
	Dirt, Ash	5	490	0.75			
7	A. Define: Waste & Hazardous waste Management as per Hazardous waste management rule, 2016. Discuss the various characteristics of hazardous waste. B. Draw a labelling format of hazardous waste on storage container or transport vehicle. C. Discuss any two feasible hazardous waste disposal techniques as per hazardous waste management rules, 2016.				10+ 04+ 06	2	1,2,3 6,7



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EndSem/Re-exam (Regulation 22)
May 2025

Max. Marks: 50

Class: T.Y. B. Tech

Name of the Course: Environmental Studies

Course Code: MC-102

Instructions:

Attempt any five questions

Draw neat sketches/diagrams wherever required

Assume suitable data if necessary and state them clearly

Figure on right indicate maximum marks for the given question, course outcomes attained and module no. of questions

Duration: 2 Hrs

Semester: VI

Program: Civil

17/5/25

			CO	BL
Q1	Answer the following Questions	(10)	1-3	2
(a)	Enlist water pollutants. Explain the water pollutants in detail	(05)		
(b)	Discuss air pollution and control measures	(05)		
Q2	Explain (i) Transfer stations (ii) Incineration (iii) Pyrolysis (iv) Factors affecting waste generation	(10)	1-3	2
Q3	Answer the following questions	(10)	2	3
a)	Convert 40 ppm of NO ₂ to µg/m ³ at STP	(3)		
b)	Convert 120 µg/m ³ of NO ₂ to ppm at STP	(3)		
c)	Find Leq for dB readings taken every min for 15 min (every one min) 32, 30, 34, 36, 37, 39, 30, 33, 28, 30, 31, 32, 33, 32 and 34	(4)		
	Atomic weights: Al=27; Ca=40; C=12; O=16; S=32; Cl=35.5; H=1; Na=23; Fe= 55.5; Mg=24; Si=14			
Q4	Draw flowsheet of ground water treatment and explain the working of each unit and reduction of specific parameters in each unit	(10)	2	3
Q5	Explain in short following laws and legislations	(10)	3	3
(a)	EPA, 1986	(04)		
(b)	Water Act, 1974	(03)		
(c)	Air Act, 1981	(03)		

Q6	Fill in the blanks	(10)	1-3	2
(1)	The major pollutants for coal burning in industry are _____			
(2)	_____ was the cause of photochemical smog in Los Angeles			
(3)	Most dangerous plume shape is _____			
(4)	The landfill provided for hazardous waste is _____ landfill			
(5)	The total cell height of landfill is _____			
(6)	The technology of burning of waste at 800-1200 degree celsius producing gases is called as _____			
(7)	_____ is biological method to reduce soil pollution			
(8)	_____ Act is responsible for creation of CPCB and MPCB			
(9)	_____ condition in lakes is caused due to excess of nutrients			
(10)	_____ Pollution occurs due to disposal of hot wastewater in water bodies.			
Q7	Give an account of ecosystem observed in our college. Also give an account of development of Bhavan's adventure centre and kind of flora and fauna observed.	(10)	1-3	3
ALL THE BEST				



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END SEM/RE-EXAM EXAMINATION -MAY / JUNE 2025

Program: Civil engineering

Duration: 3 hours

Course Code: PE-BTC622

Maximum Points: 100

Course Name: GIS Science & Applications

Semester: VI

Notes:

1. Question no.1 and 7 is compulsory
2. Attempt any THREE Questions from remaining FIVE questions.
3. Start every MAIN question from a new page.
4. Answers should be accompanied with proper figures and tables, wherever necessary.
5. Don't write the answers in Pencil.

Q.no.	Question	Points	CO	BL
1	a) Explain what you mean by metadata of raster dataset (4). b) Compare database structure models based on its use, applicability, advantages, and complexity (4). c) Compare run length encoding and quadtree encoding (4). d) Explain what open geospatial consortium (OGC) is and give examples of OGC services (4). e) Describe, in short, the four attribute data models used in GIS (4).	20	1,2,3,4	1,2
2	a) Define Geographic Information System (GIS). Explain its major components. (5) b) Discuss the development of GIS and the significance of the Canada Geographic Information System (CGIS). (5) c) Evaluate the application of GIS in urban planning and infrastructural development. Provide examples to illustrate how GIS aids in tasks such as land use planning, zoning, and traffic management. (10)	20	1,2,3,4	1,2,3
3	a) Explain different types of vector data models with proper real world examples of these models, its application, advantages and limitations. (10) b) Explain the steps involved in creating a thematic map (e.g., land use, population density, or flood risk) in a Quantum GIS (QGIS) environment. Mention the tools and techniques used. (10)	20	3,4	1,2
4	a) Explain the flat file and hierarchical model for attribute data storage used in a GIS (4) and give its application, advantages and disadvantages (6).	20	3,4	1,2,3



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END SEM/RE-EXAM EXAMINATION -MAY / JUNE 2025

	b) Explain the zonal operations to calculate the zonal geometry (area, perimeter, and centroid) that can be carried out on a given raster data. (10)			
5	a) Explain how overlay tool is used in urban planning. Illustrate with a case or example. (8) b) State different spatial aggregation methods in raster analysis (2) and explain in detail how spatial aggregation (raster analysis) works with a given a raster data (10).	20	3,4	2,3
6	You have undertaken a project-based study utilizing open-source geospatial tools such as QGIS and Google Earth Engine to assess the impact of Jalkund (water harvesting structures) on vegetation health, using the Normalized Difference Vegetation Index (NDVI) in the Molgi cluster of Nandurbar district, Maharashtra, for any one year (2022, 2023, or 2024). a) Explain the methodology adopted for NDVI analysis in Google Earth Engine. Include details on data sources, selected time frame, and the key image processing steps involved. (8) b) Analyze the spatial NDVI variations in regions with and without Jalkunds. What conclusions can be drawn about vegetation condition or productivity based on the observed patterns. (6) c) Identify the limitations encountered during this analysis and propose methods to enhance the accuracy or scalability of such assessments using open-source geospatial platforms. (6)	20	5	2,3,4
7	a) Using the provided sales data of Fuel stations for a region: Create a new shapefile for the dataset and save it as: <i>FS_sales_reg.no</i> . Save the GeoPackage layer in the OUTPUT folder (3). Briefly list the steps you followed (1). Change the symbology style of this layer to "Topographic (Topo) - Pop Capital". Take a screenshot or export the map with this symbology and save it as: <i>FS_symbol_reg.no.png</i> (1). Briefly list the steps you followed for changing the symbology (1). Select all features (e.g., polygons or points) where the recorded sales are 40crores, 48crores and 50crores. Use the Select by Expression tool in QGIS to perform the selection. Save the selected features as a new GeoPackage layer named: <i>FS_Sel_reg.no</i> . Save the GeoPackage layer in the OUTPUT folder (3). Briefly list the steps you followed (1). b) Distinguish between Internet GIS and WebGIS (2). State the elements of a WebGIS (2) and give the advantages (3) and challenges of using WebGIS (3).	20	5	2,3



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End Semester 2025 Examinations

May 2025

Set A



Program: **TY. BTECH CME** *Sum VI*
Course Code: OE BTC 616
Course Name: **Career Planning and Interpersonal Skills for Business**

Duration: **03 hour**
Maximum Points: **100**
Semester: **VI**

Note: Out of seven questions attempt any five.

Sr. no	QUESTIONS	Poi nts	CO	BL
Q.1.	In response to the advertisement below prepare a cover letter and curriculum Vitae. Exciting Career Opportunity for Core Branch Engineers Company: Larsen & Toubro (L&T) Position: Graduate Engineer Trainee (GET) – Core Engineering Roles Eligible Branches: Civil, Mechanical, Electrical Eligible Students: 3rd Year B.E./B.Tech Students (Batch of 2026) Location: Pan-India Project Sites & Offices What We Offer: Hands-on training on real-world mega projects Opportunity to work with industry experts Career growth in core engineering fields Competitive compensation and benefits Eligibility Criteria: • Currently pursuing B.E./B.Tech in Civil, Mechanical, or Electrical Engineering • Minimum 60% aggregate across academics (10th, 12th, and all semesters till date) • Strong technical fundamentals and aptitude for fieldwork • Excellent communication and teamwork skills	20	01	03
Q.2.	Read the case let below and answer the questions on Etiquette and Mannerism. <i>Ankita Sharma, a senior project engineer at Nexus Infrastructure Pvt.</i>	20 05 ma rks	04	03

Ltd., was scheduled to meet an international client team from Japan to discuss the launch of a joint venture project. Ankita, known for her technical expertise, believed that results spoke louder than formalities.

On the day of the meeting, Ankita arrived exactly on time but was surprised to find that the Japanese delegation had already been seated 15 minutes earlier. She greeted them with a quick handshake and immediately opened her laptop to start presenting the project metrics. She spoke confidently but frequently interrupted the translator assigned to help bridge the language gap. During the session, she often checked her smartwatch for notifications and occasionally leaned back casually in her chair.

At the end of the meeting, Ankita handed out business cards she had printed that morning, without much attention to their presentation. She left promptly after saying, "Let's hope for the best outcome," without staying for the customary tea session arranged by the clients.

Two days later, her manager informed her that while the client appreciated the technical quality of the project, they were hesitant about moving forward, citing concerns about the "professional interaction" during the meeting.

Questions:

1. Identify and discuss at least three breaches of professional etiquette demonstrated by Ankita during the meeting. 05
2. From a cross-cultural communication perspective, what specific Japanese business etiquette norms did Ankita overlook, and how could this affect business trust? 05
3. Propose three immediate corrective actions Ankita could take to salvage the client relationship. 05
4. Reflect on the importance of non-verbal communication in international professional settings. How did Ankita's non-verbal cues contribute to the negative client feedback? 05

each
question

Q.3. A.	What is a group discussion? What are the points that you will keep in mind before attending a GD?	10	02	01
Q.3. B	Explain in detail the evaluation rubrics used by evaluators during a GD	10	02	01
Q.4. A	What are the various kinds of background checks that are done in case of a selected candidate? Why? How will you plan for your interview?	10	03	02
Q.4. B	What are the various types of Interviews? Explain in detail	10	01	02
Q.5. A.	Prepare a SWOT analysis of your branch in which you are currently studying. Use the four quadrants diagram.	10	01	03
Q.5.	Explain the typical recruitment process with stages in sequence.	10	01	03

B

Q.6.

A.

1. Which of the following best defines accountability?

- A. Doing what you're told without asking questions
- B. Taking responsibility for your actions and their outcomes
- C. Delegating tasks to others
- D. Avoiding blame at all costs

10

04

03

2. Which of these is a key sign of ownership in the workplace?

- A. Blaming a teammate when something goes wrong
- B. Waiting for instructions before taking action
- C. Taking initiative to solve problems without being told
- D. Completing only the tasks listed in your job description

3. What should you do if you realize you might miss a project deadline?

- A. Wait and see if you can make up time later
- B. Blame the tools or technology used
- C. Inform your supervisor early and suggest alternatives
- D. Hide the delay until asked

4. When a task goes wrong and you're responsible, what is the most accountable action?

- A. Deny involvement
- B. Acknowledge the mistake and learn from it
- C. Blame others on your team
- D. Avoid talking about it

5. Which phrase demonstrates a lack of ownership?

- A. "Let's find a solution together."
- B. "That's not my job."
- C. "Here's how I'll fix this."
- D. "I'll follow up on that."

6. Why is accountability critical in engineering and technical roles?

- A. Because engineers are paid more
- B. Because errors can have serious safety or financial consequences
- C. Because most work is repetitive
- D. Because engineers do not work in teams

7. Taking ownership of a team project means:

- A. Completing only your assigned section
- B. Micromanaging teammates
- C. Ensuring the entire project succeeds, supporting others if needed
- D. Complaining if others don't work as hard

1,000 units. Priya believed this price could be reduced based on a market report suggesting average rates closer to ₹16,50,000.

She scheduled a virtual meeting with Mr. Arvind, Delta's senior sales executive. From the beginning, Mr. Arvind emphasized their superior product quality and timely delivery record. Priya acknowledged this but pointed out that another vendor had offered similar specifications for ₹16,40,000 — though with a longer lead time.

During the conversation, Priya remained calm and factual. She avoided directly threatening to walk away but clearly stated her budget constraints and stressed long-term partnership potential. She proposed ₹16,75,000 with scope for future orders if the current deal was favorable.

Mr. Arvind pushed back, citing increased raw material costs and existing demand. After a pause, he counter-offered: ₹17,10,000 with a shorter lead time and one-year warranty extension. Priya took time to consider and consulted her project manager. The next day, she accepted the revised offer, seeing value in the balance between price and service.

Questions:

1. Evaluate Priya's negotiation strategy. What key principles of effective negotiation did she apply? 03
2. What alternatives did both parties have during this negotiation? Identify their BATNAs (Best Alternative To a Negotiated Agreement). 03
3. How did Priya manage the balance between assertiveness and relationship-building? Why is this important in negotiations?



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END SEM/PE-EXAM EXAMINATION -MAY / JUNE 2025

Program: T Y B. Tech CIVIL

Duration: 3 Hrs

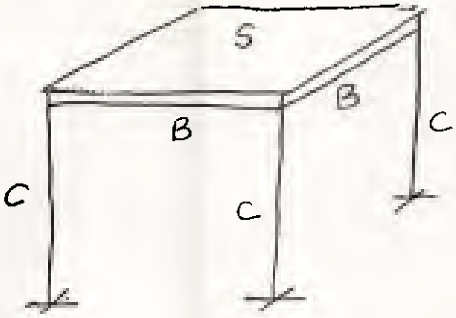
Course Code: PE-BTC626

Maximum Points:100

Course Name: Maintenance, Repairs and Rehabilitation of Structures

Semester: VI

Notes: Question no.1 is compulsory, solve any 4 questions out of remaining 6 questions

Q.No.	Questions	Points	CO	BL	Module No.
Q.1(a)	I) What is the objective of maintenance? II) Explain the process of corrosion in RCC	08	CO1	3	1/2
Q 1(b)	Draw crack patterns for column beam slab frame shown for 1) Corrosion 2) Scaling 3) Flexure over loading 4) Shear overloading 5) Settlement of support 6) Shrinkage and creep 	12	CO2	3	2
Q.2(a)	What is the difference between Strengthening and retrofitting and repairs of concrete structures.	08	CO5	3	6
Q.2(b)	Explain in detail various methods of retrofitting and how the columns are retrofitted using FRP	12	CO5	3	6
Q.3(a)	What are the Parameters for selection of Repair materials	10	CO2	3	5



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END SEM/~~RE~~-EXAM EXAMINATION -MAY / ~~JUNE~~ 2025

Q.3(b)	Explain half cell potentiometer test in detail with proper sketches	10	CO3	3	4
Q.4(a)	Explain Importance of NDT and DT for concrete. classify them as tests for strength and test for durability.	08	CO3	3	4
Q.4(b)	Write note on RCPT and RCMT	12	CO3	3	4
Q.5 (a)	Explain the importance and limitations of chlorine extraction and re-alkalization and how it is performed	12	CO4	3	7
Q.5(b)	To address corrosion, how Electro chemical repair using cathodic protection is performed. Explain in detail	08	CO4	3	7
Q.6(a)	Explain how concrete behaves as fire temperature increases.	06	CO2	3	7
Q.6(b)	What precautions need to be taken while conducting condition assessment of fire damaged structure	14	CO3	3	4
Q.7 (a)	Explain different methods of controlling corrosion of Embedded Metals by Carbonation and Chloride ingress .	08	CO4	3	7
Q.7(b)	What are Mechanical, Chemical and Physical causes of Deterioration of Cementitious System? Explain in detail	12	CO3	3	2

Program: T.Y. Civil Engineering (UG) *Sum VI*

Duration: 03 Hrs.

Course Code: PE-BTC 633

Maximum Points: 100

Course Name: Professional Elective-II: Open Channel Flow

Semester: VI

Notes:

- Attempt **any five** questions.
- Answer to all sub questions should be grouped together.
- **Figure** to right indicates full marks.
- Assume suitable data wherever necessary and state it **clearly**.

Q. No.	Questions	Points	CO	BL	Module
1	(a) What is the difference between open channel flow and pressure flow? Explain with neat sketches.	10	3	2	1
	(b) Classify types of flows in open channel and derive Chezy's equation.	10	3	3	1
2	(a) Explain the concept of specific energy and prove that Froude No. $(Fr) = V/(g.Y)^{1/2} = 1$ for critical flow.	10	1	3	2
	(b) A trapezoidal channel with bottom width 3.5 m and side slopes 1H: 1 V on the left and 1.5H: 1V on the right, with n 0.016, and a bed slope of 2.6 in 10,000 carries a discharge of 8 cum/sec. Determine the normal depth and the average shear stress on the channel bed.	10	1	5	2
3	(a) Explain momentum equation for a channel flow, derive specific force (F) and explain specific force diagram.	10	1	2	2
	(b) In a rectangular channel 3.5 m wide laid at a slope of 1/277, uniform flow occurs at a depth of 2m. Find how high can the hump be raised without causing afflux? If the upstream depth of flow is to be raised to 2.5 m, what should be the height of hump? Take Manning's $n = 0.015$.	10	1	4	2
4	(a) Derive dynamic equation of gradually varied flow (GVF) in case of a wide rectangular channel.	10	2	2	3
	(b) A rectangular flume 2.10 m wide carries discharge at the rate of 2.20 m ³ /sec. The bed slope of the flume is 0.0045. At a certain section the depth of flow is 1m. Calculate the distance of the section downstream where	10	2	3	3



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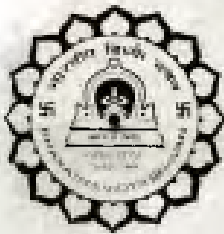
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END SEM/RE-EXAM. EXAMINATION MAY/JUNE 2024-25

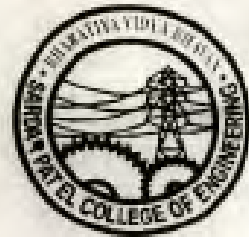
	the depth of flow is 0.92 m. Solve by single step method. Assume rugosity coefficient as 0.015. Is the slope of the channel mild or steep?				
	(a) Derive discharge expression for flow through Venturiflume. Also explain its working with neat sketch.	10	2	2	4
5	(b) A hydraulic jump is formed in a 5 m wide outlet at a short distance downstream of control gate. If the flow depths are 10 m and 2 m u/s and d/s respectively of the sluice gate and the discharge is 15 cum/sec. Determine (i) Flow depth downstream of the jump; and (ii) Head loss in the hydraulic jump.	10	2	4	3
	(a) Explain surges in open channel flow. Draw neat sketches and explain the terms used.	10	2	5	3
6	(b) The depth and velocity of flow in a rectangular channel are 1.10 m and 1.60 m/sec respectively. If the rate of inflow at the upstream end is suddenly doubled, what will be the height and absolute velocity of the resulting surge and the celerity of the wave?	10	2	2	3
	(a) Explain with neat sketches: Spatially Varied Flow (SVF).	10	2	4	5
7	(b) Write short notes on: Mechanism of sediment transport, sediment load and discuss any case study on sedimentation.	10	2	4	6/7



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END SEM/~~RE EXAM~~ EXAMINATION -MAY / JUNE 2025

Program: Civil Engineering

T.Y. (C) Term VI

Duration: 3hr

Course Code: PE BTC 636

Maximum Points: 100

Course Name: Watershed Development & Management

Semester: VI

Instructions:

1. Attempt any five questions.
2. Neat diagrams must be drawn wherever necessary.
3. Assume Suitable data if necessary and state it clearly.

28/5/25

Q. No.		Questions	Points	CO	BL	Module
1	a	It is proposed to carry out watershed management programme in a place which is village area, which is part of agricultural watershed. Discuss the steps in the process of watershed management along with required data. List the activities which you will implement as a part of watershed management.	13	CO2	BL3	1,3,4 6
	b	Calculate the availability of water in Roof Top RWH system for a group of 9 family members. Size of roof is 25 m X 25 m, with average annual rainfall is 1500 mm and runoff coefficient is 0.85. Also calculate availability of water for number of days along with its %. Daily consumption of water is 135 lits/capita/day.	7	CO1	BL2	5
2	a	Explain in detail types of soil erosion in a watershed with water as erosion agent.	10	CO1	BL2	4
	b	Explain in detail different characteristics of watershed and their importance in the context of watershed development and management.	10	CO1	BL2	2
3	a	Discuss about Adarsh Gram Hiware Bazar in the context of pre-watershed development and management programme.	7	CO2	BL3	7
	b	Discuss the classification of watershed on the basis of land use.	7	CO1	BL2	2
	c	Discuss the salient features of Integrated Watershed management programme.	6	CO1	BL1	6
4	a	Discuss in detail the engineering measures for soil conservation. (Draw sketch)	10	CO1	BL3	4
	b	Explain in detail the causes of watershed deterioration. Discuss the remedial measures to restore the watershed.	10	CO1	BL2	1

5	a	Discuss the objectives of PMKSY along with special emphasis on WDC 1.	8	CO1	BL2	1,5
	b	It is proposed to conserve the water, suggest suitable method of irrigation to save the water depending on the topography of the area.	6	CO1	BL2	1
	c	Discuss the need & importance of drone survey in watershed development & management.	6	CO1	BL2	2
6	a	Discuss the utility of following structures in watershed development & management. (i) Check dam (ii) Grassed waterways (iii) Gabions (iv) Contour bund (v) Bench terrace	7	CO1	BL2	4
	b	Discuss the Thrust area of Rajiv Gandhi Watershed development mission.	8	CO1	BL2	6
	c	Brief about urban recharge structure.	5	CO2	BL2	5
7	a	Discuss the different types of filtration systems to be used in rainwater harvesting system. Highlight its utility.	10	CO2	BL3	2,3
	b	Explain the interaction of surface water storage and groundwater storage when precipitation occurs in the Watershed. Discuss its importance in watershed development and management.	10	CO1	BL2	2



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END SEM Examinations May/ June 2025

Program: Civil Engineering

Re-exam 7-4-10 *sem VI*
Duration: 3hr

Course Code: PE-BTC644

Maximum Points: 100

Course Name TQM and MIS in construction

Semester: VI

Instructions:

1. Attempt any five questions.
2. Use A-4 size graph paper to draw control chart
3. Neat diagrams must be drawn wherever necessary.
4. Assume Suitable data if necessary and state it clearly.

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Q. No.		Questions	Points	CO	BL	Mod.
1	a	Explain in detail the stages involved in audit execution.	07	CO1 CO3	2	4
	b	Differentiate between cost of good quality and poor quality.	06	CO1	1	1
	c	Discuss in detail DMAIC process of six sigma.	07	CO2	1	1
2	a.	What are the advantages of Efficient MIS to an organization?	08	CO1	3	5
	b	Explain the benefit of work instruction towards quality achievement.	07	CO2	4	6
	c	Explain with neat sketch cause and effect diagram	05	CO2	3	3
3	a	Discuss in brief various sections of ISO 9001	10	CO1	2	4
	b	Following data refers to the Flowability property of self-compacted concrete at different time slot of a manufacturing of M-35 Grade of concrete. QC Managers decided to check variations in the Quality and wish to ensure the stability of process. Analyze the data and comment on the stability of process.	10	CO2	3	5

Workability test results							
Day	Observed flow rate in mm results at different time intervals						
	8.00-10.00	10.00-12.00	12.00-14.00	14.00-16.00	16.00-18.00	18.00-20.00	20.00-22.00
1	615	610	617	616	614	613	607
2	604	615	629	612	613	614	617
3	613	617	615	614	615	616	632
4	617	630	624	618	616	615	614
5	608	614	612	611	612	613	634
6	615	619	617	616	617	618	628
7	614	612	613	611	619	621	618
8	610	615	617	615	613	617	628
9	609	618	619	617	615	619	621
10	611	617	618	616	614	618	631
11	613	614	612	634	619	617	615
12	612	613	611	629	618	616	614
13	619	617	635	618	617	616	613
14	620	613	638	619	618	617	614
15	616	619	629	618	617	623	617

4	a	Why audit is necessary? What are the types of audit?	08	CO2	3	2
	b	Somero Enterprise produces Salt glazed stoneware pipes for Sewer line construction every day. A Quality inspector randomly draws samples for 20 days and reports the defective pipes for each sample size from different production lot. Based on the given data, prepare the control chart for the fraction defective and determine the process in statistical control.	12	CO1	3	5

Observations sheet of Somero Enterprise

Lot	Sample size	Number of defective pipes in the sample	Lot	Sample size	Number of defective pipes in the sample
1	1800	28	11	1800	23
2	1800	15	12	1800	29
3	1800	26	13	1800	27
4	1800	23	14	1800	39
5	1800	17	15	1800	11
6	1800	14	16	1800	28
7	1800	22	17	1800	17
8	1800	24	18	1800	19
9	1800	26	19	1800	41
10	1800	29	20	1800	22

5	a	Explain in detail the section 4 "QMS" as per ISO 9001.	10	CO4	2	4
	b	Refer the data given in Que.3b and consider the Daily average flow (workability) to perform <u>Run test</u> regarding quality characteristic of fresh concrete. Perform <u>the median test and up-down test</u> . State whether the process is in control or not. (Consider z-value of ± 2.0 for comparison 95.5 level of acceptance).	10	CO 3	3	5
6	a	Compare traditional management approach with TQM	08	CO4	1	4
	b	A company manufactures precast RCC slab for pre-engineering construction of mass housing complex with production capacity of 500 units per day.	12	CO3	3	5

Defects in each components are recorded during testing. These defects are, surface cracks; surface unevenness; thickness variation; sagging; reinforcement exposed and broken edges. Based on the given data, draw the appropriate control chart and comment on the state of control.

Observations sheet for RCC slabs

Lot	Sample size	No. of defects in the sample	Lot	Sample size	No. of defects in the sample	Lot	Sample size	No. of defects in the sample
1	500	12	11	500	23	21	500	18
2	500	14	12	500	19	22	500	14
3	500	16	13	500	31	23	500	16
4	500	18	14	500	20	24	500	17
5	500	32	15	500	26	25	500	24
6	500	25	16	500	24	26	500	22
7	500	18	17	500	17	27	500	28
8	500	14	18	500	18	28	500	26
9	500	22	19	500	27	29	500	24
10	500	12	20	500	29	30	500	25

- | | | | | | |
|----|---|----|------|---|---|
| a. | Describe in detail basic principles of QMS as per of ISO 9001. | 07 | CO2 | 2 | 3 |
| b. | Discuss in detail 7 principles of TQM? | 07 | CO 2 | 1 | 2 |
| c. | Refer the data given in Que 6 b and determine the Six sigma value of a construction project by referring following table. | 06 | CO3 | 3 | 5 |

Sigma Level	Defects per Million Opportunities	Percentage Yield
1 σ	691,462	31
2 σ	308,537	69
3 σ	66,807	93.3
4 σ	6,210	99.38
5 σ	233	99.977
6 σ	3.4	99.99966

Reference table for Mean and Range Chart

Tabular values for X-bar and range charts				
Subgroup Size	A ₂	d ₂	D ₃	D ₄
2	1.880	1.128	—	3.268
3	1.023	1.693	—	2.574
4	0.729	2.058	—	2.282
5	0.577	2.326	—	2.114
6	0.483	2.534	—	2.004
7	0.419	2.704	0.078	1.924
8	0.373	2.847	0.136	1.854
9	0.337	2.970	0.184	1.816
10	0.308	3.078	0.223	1.777



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RE-EXAMINATION/ END SEMESTER EXAMINATION (MAY – JUNE) 2025

Program: Civil Engineering

Course Code: PE – BTC – 664

Course Name: Traffic Engineering and Control (elective)

Duration: 3 Hours

Maximum Points: 100

Semester: VI

Notes:

- i. Q.1. is compulsory
- ii. Solve any four questions out of remaining six questions
- iii. Assume suitable data if required

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Q.No.	Questions	Points	CO	BL																																								
Q.1																																												
a	Explain with neat sketch following types of Road Marking (a) Centre line marking (b) Lane distribution marking (c) Edge Marking (d) Stop marking (e) Cross walk marking	10	01	01																																								
b	The spot speed study were carried out at a stretch of road. The consolidated data are shown in table below. Determine the following. (i) Graphically Upper speed limit, lower speed limit and speed for geometric design. (ii) Standard deviation and variance <table><tr><td>25</td><td>36</td><td>29</td><td>30</td><td>28</td><td>50</td><td>62</td><td>68</td><td>70</td><td>32</td></tr><tr><td>39</td><td>44</td><td>46</td><td>48</td><td>41</td><td>38</td><td>35</td><td>31</td><td>40</td><td>33</td></tr><tr><td>27</td><td>29</td><td>31</td><td>34</td><td>38</td><td>39</td><td>40</td><td>51</td><td>53</td><td>54</td></tr><tr><td>56</td><td>58</td><td>59</td><td>60</td><td>51</td><td>52</td><td>55</td><td>48</td><td>47</td><td>49</td></tr></table>	25	36	29	30	28	50	62	68	70	32	39	44	46	48	41	38	35	31	40	33	27	29	31	34	38	39	40	51	53	54	56	58	59	60	51	52	55	48	47	49	10	02	03
25	36	29	30	28	50	62	68	70	32																																			
39	44	46	48	41	38	35	31	40	33																																			
27	29	31	34	38	39	40	51	53	54																																			
56	58	59	60	51	52	55	48	47	49																																			
Q.2.																																												
a	Enlist the different methods available for conducting traffic survey for estimation of running speed and journey speed. Explain the field procedure of conducting the traffic survey by moving car method. How will you record the data collected.	10	02																																									



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RE-EXAMINATION/ END SEMESTER EXAMINATION (MAY – JUNE) 2025

	improvement of GF																																					
	Before improvement of GF	38 km/hr	15.8 km/hr	300																																		
Q.5																																						
a	Discuss transportation model with respect to its application in infrastructure project.					08	02	02																														
b	The company has a three concrete mixing plant A, B, and C which supply concrete for the construction of cement concrete road at four different location D, E, F, and G. The daily supply capacity of concrete mixing plant A, B and C are 1500, 2500 and 500 units respectively. The maximum demand of concrete at four different location D, E, F, and G are 500, 1500, 1500 and 1000 units respectively. The unit transportation cost from one location to other location are given in the table below. Obtain the initial feasible solution by (i) N – W corner method and (ii) Least cost method <table><tr><td></td><td>D</td><td>E</td><td>F</td><td>G</td><td>Supply</td></tr><tr><td>A</td><td>5</td><td>2</td><td>8</td><td>20</td><td>1500</td></tr><tr><td>B</td><td>4</td><td>7</td><td>9</td><td>11</td><td>2500</td></tr><tr><td>C</td><td>10</td><td>1</td><td>15</td><td>6</td><td>500</td></tr><tr><td>Demand</td><td>500</td><td>1500</td><td>1500</td><td>1000</td><td></td></tr></table>						D	E	F	G	Supply	A	5	2	8	20	1500	B	4	7	9	11	2500	C	10	1	15	6	500	Demand	500	1500	1500	1000		12	02	03
	D	E	F	G	Supply																																	
A	5	2	8	20	1500																																	
B	4	7	9	11	2500																																	
C	10	1	15	6	500																																	
Demand	500	1500	1500	1000																																		
Q.6.																																						
a	Write short notes on At grade Intersection					06		01																														
b	Discuss the guide line for signal installation					06		02																														
c	The 15 minutes traffic count on cross road A and Road B during peak hour are observed as 178 vech/lane and 142 vech/lane respectively approaching the intersection in the direction of heavy traffic flow. The amber time required is 3 second and 2 second for two roads based on approach speed. Design the signal timing by trial cycle method. Assume an average time headway of 2.5 second during green phase.					08		03																														
Q.7.																																						
a	Discuss factor governing trip generation and trip attraction					08		02																														
b	The self-contained town consist of three residential area A, B and C and					12		04																														



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RE EXAMINATION/ END SEMESTER EXAMINATION (MAY – JUNE) 2025

two industrial area X and Y. The generation year shows that for the design year in the equation the trip from home to work generated by each residential area per day is shown in table 1.

There are 4000 jobs in industrial area X and 3200 jobs in industrial area Y. it is known that attraction between zones is inversely proportional to square of journey time between zones. The journey time in minutes from residential area to industrial area are shown in table 2.

Calculate the internal zonal trip from home to work using gravity model.

Table 1

Residential area	Trip generated per day
A	2250
B	1750
C	3200

Table 2

Residential area	Industrial area X	Industrial area Y
A	15	10
B	10	15
C	15	20

Table 2: Critical Values of Student's t-Distribution

Table 2: Critical Values of Student's t-Distribution						
d.f.	Level of significance for two-tailed test					d.f.
	0.20	0.10	0.05	0.02	0.01	
	Level of significance for one-tailed test					
	0.10	0.05	0.025	0.01	0.005	
1	3.078	6.314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	6
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3.355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1.356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2.977	14
15	1.341	1.753	2.131	2.602	2.947	15
16	1.337	1.746	2.120	2.583	2.921	16
17	1.333	1.740	2.110	2.567	2.898	17
18	1.330	1.734	2.101	2.552	2.878	18
19	1.328	1.729	2.093	2.539	2.861	19
20	1.325	1.725	2.086	2.528	2.845	20
21	1.323	1.721	2.080	2.518	2.831	21
22	1.321	1.717	2.074	2.508	2.819	22
23	1.319	1.714	2.069	2.500	2.807	23
24	1.318	1.711	2.064	2.492	2.797	24
25	1.316	1.708	2.060	2.485	2.787	25
26	1.315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1.313	1.701	2.048	2.467	2.763	28
29	1.311	1.699	2.045	2.462	2.756	29

z	$\phi(z)$	z	$\phi(z)$	z	$\phi(z)$
2 0.25	0.5987	0.60	0.7257	0.95	0.8289
.26	.6026	.61	.7291	.96	.8315
.27	.6064	.62	.7324	.97	.8340
.28	.6103	.63	.7357	.98	.8365
.29	.6141	.64	.7389	.99	.8389
0.30	0.6179	0.65	0.7422	1.00	0.8413
.31	.6217	.66	.7454	.01	.8438
.32	.6255	.67	.7486	.02	.8461
.33	.6293	.68	.7517	.03	.8485
.34	.6331	.69	.7549	.04	.8508
1.05	0.8531	1.55	0.9394	2.05	0.97982
.06	.8554	.56	.9406	.06	.98030
.07	.8577	.57	.9418	.07	.98077
.08	.8599	.58	.9429	.08	.98124
.09	.8621	.59	.9441	.09	.98169
1.10	.8643	1.60	0.9452	2.10	0.98214
.11	.8665	.61	.9463	.11	.98257
.12	.8686	.62	.9474	.12	.98300
.13	.8708	.63	.9484	.13	.98341
.14	.8729	.64	.9495	.14	.98382
1.15	0.8749	1.65	0.9505	2.15	0.98422
.16	.8770	.66	.9515	.16	.98461
.17	.8790	.67	.9525	.17	.98500
.18	.8810	.68	.9535	.18	.98537
.19	.8830	.69	.9545	.19	.98574
1.20	0.8849	1.70	0.9554	2.20	0.98610
.21	.8869	.71	.9564	.21	.98645
.22	.8888	.72	.9573	.22	.98679
.23	.8907	.73	.9582	.23	.98723
.24	.8925	.74	.9591	.24	.98745
1.25	0.8944	1.75	0.9599	2.25	0.98778
.26	.8962	.76	.9608	.26	.98809
.27	.8980	.77	.9616	.27	.98840
.28	.8997	.78	.9625	.28	.98870
.29	.9015	.79	.9633	.29	.98899
1.30	0.9032	1.80	0.9641	2.30	0.98928
.31	.9049	.81	.9649	.31	.98956
.32	.9066	.82	.9656	.32	.98983
.33	.9082	.83	.9664	.33	.99010
.34	.9099	.84	.9671	.34	.99036
1.35	0.9115	1.85	0.9678	2.35	0.99061
.36	.9131	.86	.9686	.36	.99086
.37	.9147	.87	.9693	.37	.99111
.38	.9162	.88	.9699	.38	.99134
.39	.9177	.89	.9706	.39	.99158

z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$
0.00	0.5000	0.35	0.6328	0.70	0.7580
0.01	0.5040	0.36	0.6368	0.71	0.7618
0.02	0.5080	0.37	0.6406	0.72	0.7654
0.03	0.5120	0.38	0.6443	0.73	0.7688
0.04	0.5159	0.39	0.6479	0.74	0.7720
0.05	0.5198	0.40	0.6515	0.75	0.7750
0.06	0.5236	0.41	0.6550	0.76	0.7779
0.07	0.5274	0.42	0.6585	0.77	0.7806
0.08	0.5311	0.43	0.6619	0.78	0.7832
0.09	0.5348	0.44	0.6653	0.79	0.7857
0.10	0.5384	0.45	0.6686	0.80	0.7881
0.11	0.5419	0.46	0.6718	0.81	0.7904
0.12	0.5454	0.47	0.6750	0.82	0.7926
0.13	0.5488	0.48	0.6781	0.83	0.7947
0.14	0.5522	0.49	0.6811	0.84	0.7967
0.15	0.5556	0.50	0.6841	0.85	0.7986
0.16	0.5590	0.51	0.6870	0.86	0.8004
0.17	0.5623	0.52	0.6899	0.87	0.8021
0.18	0.5656	0.53	0.6927	0.88	0.8037
0.19	0.5688	0.54	0.6955	0.89	0.8052
0.20	0.5720	0.55	0.6982	0.90	0.8066
0.21	0.5752	0.56	0.7009	0.91	0.8079
0.22	0.5783	0.57	0.7035	0.92	0.8091
0.23	0.5814	0.58	0.7061	0.93	0.8103
0.24	0.5845	0.59	0.7086	0.94	0.8114

z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$
1.40	0.9192	1.90	0.9691	2.40	0.9918
1.41	0.9207	1.91	0.9706	2.41	0.9924
1.42	0.9222	1.92	0.9720	2.42	0.9929
1.43	0.9236	1.93	0.9734	2.43	0.9934
1.44	0.9251	1.94	0.9748	2.44	0.9938
1.45	0.9265	1.95	0.9762	2.45	0.9942
1.46	0.9279	1.96	0.9776	2.46	0.9946
1.47	0.9293	1.97	0.9789	2.47	0.9950
1.48	0.9306	1.98	0.9803	2.48	0.9954
1.49	0.9319	1.99	0.9816	2.49	0.9957
1.50	0.9332	2.00	0.9829	2.50	0.9960
1.51	0.9345	2.01	0.9841	2.51	0.9963
1.52	0.9357	2.02	0.9853	2.52	0.9966
1.53	0.9370	2.03	0.9865	2.53	0.9969
1.54	0.9382	2.04	0.9877	2.54	0.9972
2.55	0.9974	2.75	0.9996	2.76	0.9997
2.56	0.9977	2.76	0.9997	2.77	0.9998
2.57	0.9979	2.77	0.9998	2.78	0.9998
2.58	0.9981	2.78	0.9998	2.79	0.9999
2.59	0.9982	2.79	0.9999	2.80	0.9999
2.60	0.9984	2.80	0.9999	2.81	0.9999
2.61	0.9985	2.81	0.9999	2.82	0.9999
2.62	0.9986	2.82	0.9999	2.83	0.9999
2.63	0.9987	2.83	0.9999	2.84	0.9999
2.64	0.9988	2.84	0.9999	2.85	0.9999
2.65	0.9989	2.85	0.9999	2.86	0.9999
2.66	0.9990	2.86	0.9999	2.87	0.9999
2.67	0.9991	2.87	0.9999	2.88	0.9999
2.68	0.9992	2.88	0.9999	2.89	0.9999
2.69	0.9993	2.89	0.9999	2.90	0.9999
2.70	0.9994	2.90	0.9999	2.91	0.9999
2.71	0.9995	2.91	0.9999	2.92	0.9999