Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

TERM END EXAMINATION DECEMBER 2024 2/12/24

Program: B. Tech (Civil) Sem VII **Duration: 3 Hr**

Course Code: PC-BTC701 **Maximum Points: 100**

Course Name: Design of concrete structure **Semester: VII**

Notes: Question no. 1 compulsory Solve any four questions out of remaining question.

Q.No.	Questions	Points	CO	BL	Modu No.
1 (a)	What is the permissible crack width allowed for water tank walls? What are different measures taken to limit permissible crack width for water tank	05	CO1	02	06
1 (b)	Explain difference between structural behavior of cantilever and counterfort retaining wall.	05	CO1	02	05
1(c)	Why Ductile detailing, as outlined in IS 13920:2016, is crucial even when a structure is designed using IS 1893, which considers seismic loads. **Explain in detail**	10	CO3	02	04
2(a)	Design a staircase block dimensions for dog legged staircase case to be provided for floor to floor height of 3.00 M. Design flight of dog legged staircase from floor slab to mid landing slab The Live load on slab is 4.0 kn/m2, floor finish is 1.0 kn/m2 in addition to self-weight of slab. Use M20 concrete and Fe 415 steel. **Draw a section to the scale showing reinforcement details.**	15	CO1/CO2/ CO3	03	01
2(b)	What is the meaning of ductile detailing and where it is mandatory as per IS codes	05	CO3	02	04
3	For a cantilever retaining wall **retaining inclined soil backfill at an angle of 15°**, of height 4.0 m above toe side ground floor. The good soil strata is available at depth of 1.5 m with SBC of soil as 160 kn/m^2. The angle of shearing resistance for soil is 30^0, Unit weight of soil is 16 Kn/m^3 Coefficient of friction between soil and concrete is 0.5. Use M20 concrete and Fe 415 steel. **Perform stability checks.** **Design Toe slab only.** **Draw a section to the scale showing reinforcement details.**	20	CO1/CO2/ CO3	03	05

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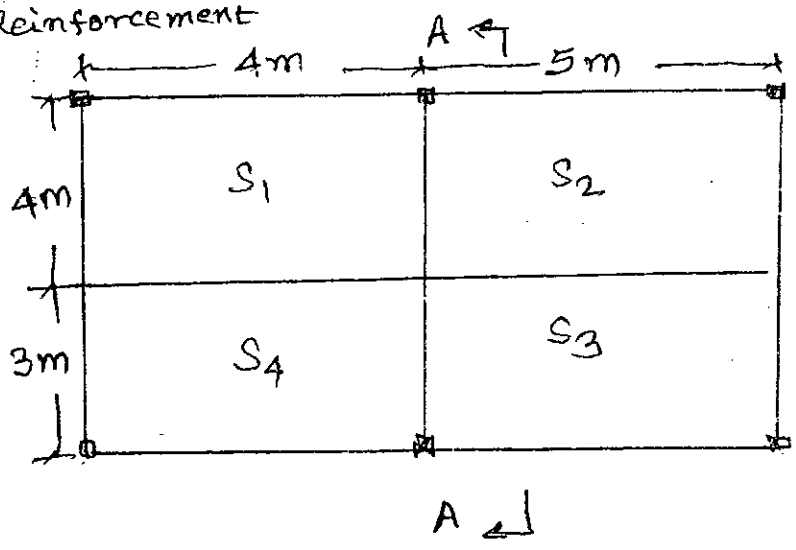
4(a)	Design interior panel of flat slab with drop, of c/c distance between columns 7.0 m in both directions. Use floor finish load as 1.0 Kn/m^2 and live load 4.0 Kn/ m^2 .size of column 500 mm x 500 mm. Use M40 concrete and Fe 415 steel. **Use direct design method Design for moments, shear check required. Draw reinforcement in plan clearly marking bottom and top reinforcement**	17	CO1/CO2/ CO3	03	02
4(b)	Explain why flat slabs are not provided in high seismic zones	03	CO1	03	02
5(a)	For the slab arrangement shown, calculate final design moments after balancing. Slab is subjected to floor finish load as 1.0 Kn/m^2 and live load 3.0 Kn/m^2 . Design reinforcement. Use M20 grade of concrete and Fe 415 steel. Draw a section AA showing Reinforcement 	12	CO1/CO3	03	03
5(b)	Design circular water tank with **flexible base joint** for 450,000 liters resting on ground and open at top. Use M30 grade concrete and Fe 415 grade steel	08	CO1/CO3	03	06
6(a)	Design circular water tank with **rigid fixed joint at base** for height of tank 6.0 m and diameter of tank 14 m resting on ground and open at top. Use M30 grade concrete and Fe 415 grade steel. **Use IS 3370 code coefficients for moment and shear calculations. Draw sectional elevations showing reinforeement details.**	14	CO1/CO2/ CO3	03	07

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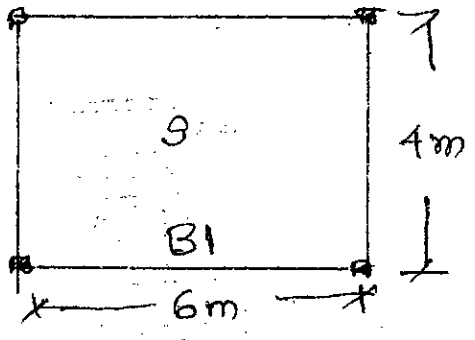
6(b)	Analyse and design beam marked on plan as B1. Thickness of slab 150 mm , floor finish 1.0 Kn/m^2 and live load 4.0 Kn/m^2. 230 mm thk brick wall of height 3.00 m is resting on beam 	06	CO1	03	04
7	Design rectangular water tank resting on ground open at top of size 4.00 m x 7.00 m in plan and height 3.5 m . Free board is 150 mm using approximate analysis. **Calculate the reinforcement using M 30 concrete and Fe 415 steel. Draw reinforcement in plan and also in sectional elevation.**	20	CO1/CO2/ CO3	03	07

Pg3

Table 5 Ring Tension Coefficients for Case 2 Arrangement

(*Table* 1, *Clauses* 3.1 *and* 3.1.6)

H^2/Dt	Coefficients at Point (*see* Notes 1 and 2 at the end of Table 5A)									
	0.0*H*	0.1*H*	0.2*H*	0.3*H*	0.4*H*	0.5*H*	0.6*H*	0.7*H*	0.8*H*	0.9*H*
0.4	+0.582	+0.505	+0.431	+0.353	+0.277	+0.206	+0.145	+0.092	+0.046	+0.013
0.8	+1.052	+0.921	+0.796	+0.669	+0.542	+0.415	+0.289	+0.179	+0.089	+0.024
1.2	+1.218	+1.078	+0.946	+0.808	+0.665	+0.519	+0.378	+0.246	+0.127	+0.034
1.6	+1.257	+1.141	+1.009	+0.881	+0.742	+0.600	+0.449	+0.294	+0.153	+0.045
2.0	+1.253	+1.144	+1.041	+0.929	+0.806	+0.667	+0.514	+0.345	+0.186	+0.055
3.0	+1.160	+1.112	+1.061	+0.998	+0.912	+0.796	+0.646	+0.459	+0.258	+0.081
4.0	+1.085	+1.073	+1.057	+1.029	+0.977	+0.887	+0.746	+0.553	+0.322	+0.105
5.0	+1.037	+1.044	+1.047	+1.042	+1.015	+0.949	+0.825	+0.629	+0.379	+0.128
6.0	+1.010	+1.024	+1.038	+1.045	+1.034	+0.986	+0.879	+0.694	+0.430	+0.149
8.0	+0.989	+1.005	+1.022	+1.036	+1.044	+1.026	+0.953	+0.788	+0.519	+0.189
10.0	+0.989	+0.998	+1.010	+1.023	+1.039	+1.040	+0.996	+0.859	+0.591	+0.226
12.0	+0.994	+0.997	+1.003	+1.014	+1.031	+1.043	+1.022	+0.911	+0.652	+0.262
14.0	+0.997	0.998	+1.000	+1.007	+1.022	+1.040	+1.035	+0.949	+0.705	+0.294
16.0	+1.000	0.999	+0.999	+1.003	+1.015	+1.032	+1.040	+0.975	+0.750	+0.321

Table 5A Supplementary Ring Tension Coefficients for Case 2 Arrangement

(*Tables* 1 and 5, *Clauses* 3.1 *and* 3.1.6)

H^2/Dt	Coefficients at Point (*see* Notes 1 and 2)				
	0.75*H*	0.80*H*	0.85*H*	0.90*H*	0.95*H*
20	+0.949	+0.825	+0.629	+0.379	+0.128
24	+0.986	+0.879	+0.694	+0.430	+0.149
32	+1.026	+0.953	+0.788	+0.519	+0.189
40	+1.040	+0.996	+0.859	+0.591	+0.226
48	+1.043	+1.022	+0.911	+0.652	+0.262
56	+1.040	+1.035	+0.949	+0.705	+0.294

NOTES

1 Positive sign indicates tension.

2 The point, 0.0 *H* denotes the top of the tank and the point, 1.0 *H* denotes the base of the tank.

Table 6 Moment Coefficients for Case 2 Arrangement

(*Table* 1, *Clauses* 3.1 *and* 3.1.6)

H^2/Dt	Coefficients at Point (*see* Notes 1 and 2 at the end of Table 6A)									
	0.1*H*	0.2*H*	0.3*H*	0.4*H*	0.5*H*	0.6*H*	0.7*H*	0.8*H*	0.9*H*	1.0*H*
0.4	-.002 3	-.009 3	-.022 7	-.043 9	-.071 0	-.101 8	-.145 5	-.200 0	-.259 5	-.331 0
0.8	.000 0	-.000 6	-.002 5	-.008 3	-.018 5	-.036 2	-.059 4	-.091 7	-.132 5	-.183 5
1.2	+.000 8	+.002 6	+.003 7	+.002 9	-.000 9	-.008 9	-.022 7	-.046 8	-.081 5	-.117 8
1.6	+.001 1	+.003 6	+.006 2	+.007 7	+.006 8	+.001 1	-.009 3	-.026 7	-.052 9	-.087 6
2.0	+.001 0	+.003 6	.006 6	+.008 8	+.008 9	+.005 9	-.001 9	-.016 7	-.038 9	-.071 9
3.0	+.000 7	+.002 6	+.005 1	+.007 4	+.009 1	+.008 3	-.004 2	-005 3	-.022 3	-.048 3
4.0	+.000 4	+.001 5	+.003 3	+.005 2	+.006 8	+.007 5	-.005 3	-.001 3	-.014 5	-.036 5
5.0	+.000 2	+.000 8	+.001 9	+.003 5	+.005 1	+.006 1	-.005 2	+ 000 7	-.010 1	-.029 3
6.0	+.000 1	+.000 4	+.001 1	+.002 2	+.003 6	+.004 9	-.004 8	+.001 7	-.007 3	-.024 2
8.0	.000 0	+.000 1	+.000 3	+.000 8	+.001 8	+.003 1	-.003 8	+.002 4	-.004 0	-.018 4
10.0	.000 0	-.000 1	.000 0	+.000 2	+.000 9	+.002 1	+.003 0	+.002 6	-.002 3	-.014 7
12.0	.000 0	.000 0	-.000 1	.000 0	+.000 4	+.001 4	+.002 4	+ 002 2	-.001 2	-.012 3
14.0	.000 0	.000 0	.000 0	.000 0	+.000 2	+.001 0	+.001 8	+.002 1	-.000 2	-.010 5
16.0	.000 0	.000 0	.000 0	-.000 1	+.000 1	+.000 6	+.001 2	+.002 0	-.000 5	-.009 1

Table 6A Supplementary Moment Coefficients for Case 2 Arrangement

(*Tables* 1 and 6, *Clauses* 3.1 *and* 3.1.6)

H^2/Dt	Coefficients at Point (*see* Notes 1 and 2)				
	0.80*H*	0.85*H*	0.90*H*	0.95*H*	1.00*H*
20	+.001 5	+.001 3	+.000 2	-.002 4	-.007 3
24	+.001 2	+.001 2	+.000 4	-.001 8	-.006 1
32	+.000 8	+.000 9	+.000 6	-.001 0	-.004 6
40	+.000 5	+.000 7	+.000 7	-.000 5	-.003 7
48	+.000 4	+.000 6	+.000 6	-.000 3	-.003 1
56	+.000 2	+.000 4	+.000 5	-.000 1	-.002 6

NOTES

1 Positive sign indicates tension in the outside.

2 The point, 0.0 *H* denotes the top of the tank and the point, 1.0 *H* denotes the base of the tank.

TABLE 3 MOMENT COEFFICIENTS FOR INDIVIDUAL WALL PANEL, TOP FREE, BOTTOM AND VERTICAL EDGES FIXED- *Contd*

b/a	x/a	$y = 0$		$y = b/4$		$y = b/2$	
		M_x	M_y	M_x	M_y	M_x	M_y
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1·75	0	0	+0·025	0	+0·007	0	−0·050
	1/4	+0·012	+0·022	+0·005	+0·008	−0·010	−0·052
	1/2	+0·016	+0·016	+0·010	+0·009	−0·009	−0·046
	3/4	−0·002	−0·005	+0·001	−0·004	−0·005	−0·027
	1	−0·074	−0·015	−0·050	−0·010	0	0
1·50	0	0	+0·021	0	+0·005	0	−0·040
	1/4	+0·008	+0·020	+0·004	+0·007	−0·009	−0·044
	1/2	+0·016	+0·016	+0·010	+0·008	−0·008	−0·042
	3/4	−0·003	−0·006	+0·003	−0·004	−0·005	−0·026
	1	−0·050	−0·012	−0·041	−0·008	0	0
1·25	0	0	+0·015	0	+0·003	0	−0·029
	1/4	+0·005	+0·015	+0·002	+0·005	−0·007	−0·034
	1/2	+0·014	+0·015	+0·008	+0·007	−0·007	−0·037
	3/4	+0·006	+0·007	+0·005	+0·005	−0·005	−0·024
	1	−0·047	−0·009	−0·031	−0·006	0	0
1·0	0	0	+0·009	0	+0·002	0	−0·018
	1/4	+0·002	+0·011	+0·000	+0·003	−0·005	−0·025
	1/2	+0·009	+0·013	+0·005	+0·005	−0·006	−0·029
	3/4	+0·008	−0·008	+0·005	+0·004	−0·004	−0·020
	1	−0·035	−0·007	−0·022	−0·005	0	0
0·75	0	0	+0·004	0	+0·001	0	−0·007
	1/4	+0·001	+0·008	+0·000	+0·002	−0·002	−0·011
	1/2	+0·005	+0·010	+0·002	+0·003	−0·003	−0·017
	3/4	+0·007	+0·007	+0·005	+0·003	−0·003	−0·013
	1	−0·024	−0·005	−0·015	−0·003	0	0
0·50	0	0	+0·001	0	+0·000	0	−0·002
	1/4	+0·000	+0·005	+0·000	+0·001	−0·001	−0·004
	1/2	+0·002	+0·006	+0·001	+0·001	−0·002	−0·009
	3/4	+0·004	+0·006	+0·001	+0·001	−0·001	−0·007
	1	−0·015	−0·003	−0·008	−0·002	0	0

TABLE 3 MOMENT COEFFICIENTS FOR INDIVIDUAL WALL PANEL, TOP FREE, BOTTOM AND VERTICAL EDGES FIXED

(*Clauses* 2.1, 2.1.1, 2.2 *and* 2.2.2)

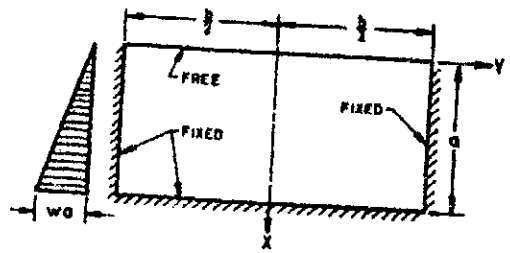
a = height of the wall

b = width of the wall

w = density of the liquid

Horizontal moment = $M_x wa^3$

Vertical moment = $M_y wa^3$



b/a	x/a	$y = 0$		$y = b/4$		$y = b/2$	
		M_x	M_y	M_x	M_y	M_x	M_y
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
3·00	0	0	+0·025	0	+0·014	0	−0·082
	1/4	+0·010	+0·019	+0·007	+0·013	−0·014	−0·071
	1/2	+0·005	+0·010	+0·008	+0·010	−0·011	−0·055
	3/4	−0·033	−0·004	−0·018	−0·000	−0·006	−0·028
	1	−0·126	−0·025	−0·092	−0·018	0	0
2·50	0	0	+0·027	0	+0·013	0	−0·074
	1/4	+0·012	+0·022	+0·007	+0·013	−0·013	−0·066
	1/2	+0·011	+0·014	+0·008	+0·010	−0·011	−0·053
	3/4	−0·021	−0·001	−0·010	−0·001	−0·005	−0·027
	1	−0·108	−0·022	−0·077	−0·015	0	0
2·00	0	0	+0·027	0	+0·009	0	−0·060
	1/4	+0·013	+0·023	+0·006	+0·010	−0·012	−0·039
	1/2	+0·015	+0·016	+0·010	+0·010	−0·100	−0·049
	3/4	−0·008	+0·003	−0·002	+0·003	−0·005	−0·027
	1	−0·086	−0·017	−0·059	−0·012	0	0

(*Continued*)

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4/12/24

END SEM/~~RE-EXAM.~~ EXAMINATION DEC/~~JAN~~ 2024-25

Program: B.Tech. Civil Engineering (UG) Sem VII

Course Code: PE-BTC-731

Course Name: Surface Hydrology

Duration: 03 Hrs.

Maximum Points: 100

Semester: VII

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)Explain water budget equation for a watershed. Discuss terms used.	10	1	2	1
	(b) Explain the energy budget method of estimating evaporation from a lake.	10	1	2	2
2	(a) Explain depth - area - duration relationship and intensity - duration - frequency relationship.	10	1	4	2
	(b) A water shed has four non recording rain gauges installed to record rainfall data. The annual rainfall record for one of the year is furnished below: **Rain gauge station** A B C D **Annual Rainfall in cm** 100 120 140 80 Assuming an error of 10% in the estimation of mean rainfall, find the required optimum number of rain gauges for this watershed.	10	1	3	2
3	(a)Explain in brief various commonly used Stream gauging techniques.	10	2	5	3
	(b) Calculate the potential evapotranspiration in the month of November for the area having details: Latitude: $28^0 5'$N, Elevation= 235 m above sea level, Saturation vapour pressure (ew)=17.55 mm of Hg, A= 1.05 mm/^{0}C, mean monthly solar radiation (Ha)= 9.50 mm of water/day, mean monthly temperature = 20^0C, mean relative humidity= 76%, mean observed sunshine hours= 9h, wind velocity at 2 m height= 86 km/day, constant (b)=0.52, Stefan-Boltzman constant = 2.01×10^{-9} mm/day.	10	2	5	2
4	(a)What is hydrograph? Explain different types of hydrograph depending upon unit of time involved and their corresponding applications. State assumptions of a unit hydrograph.	10	2	2	4
	(b) The runoff data of a stream gauging station for a flood in m^3/sec at three hourly intervals are: 50, 50, 75, 125, 225, 290, 270, 145, 110, 90, 80, 70, 60, 55, 51, 50. The drainage area is 40 km^2. The duration of the rainfall is 3 hours. Derive the three hour unit hydrograph for the basin.	10	2	2	4

	Assume a constant base flow of 50 m^3/sec throughout the duration.				
5	(a) What is Hydrological forecasting? Why it is important? Explain with an example.	10	2	3	6
	(b) Define recurrence interval or return period. A hydraulic structure is sized for a 50 year recurrence interval design discharge. What is the risk that the flow capacity will be exceeded during any future 20 years period? What is the probability that the 50 year recurrence interval peak flow rate will be exceeded in the next 50 years?	10	2	3	5
6	(a) Explain the procedure for hydrologic reservoir routing. Also explain prism and wedge storage in channel routing.	10	2	4	5
	(b) The inflow hydrograph readings for a stream reach in m^3/sec. at 12 hourly intervals are as: 42, 45, 88, 272, 342, 288, 240, 198, 162, 133, 110, 90, 79, 68, 61, 56, 54, 51, 45, 45 and 42. The Muskingum coefficients for the stream reach are k =36 hr. and x = 0.15. Determine the attenuation in peak flow discharge.	10	2	5	5
7	(a)Write short notes on (***Any Two***): (i) Flood control measures, (ii) Drought Management, (iii) Risk-reliability and safety factor	10	2	4	7
	(b) For a data of maximum recorded flood of a river, the mean and standard deviation are 4200 m^3/sec. and 1705 m^3/sec. respectively. Using Gumbel's extreme value distribution, estimate the return period of design flood of 9550 m^3/sec. Assume an infinite sample size. Take: $\overline{Yn}$ = 0.577, Sn = 1.2825.	10	2	5	6

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END SEMESTER EXAMINATION/~~RE-EXAMINATION~~

DECEMBER - 2024

B.Tech Sem VII

Program: Civil Engineering **Duration: 3 Hr.**

Course Code: PE – BTC – 761 **Maximum Points: 100**

Course Name: Pavement Design and Construction **Semester: VII**

Note :

(i) **Question 1 is compulsory**

(ii) **Solve any four questions out of remaining six questions**

(iii) **Assume suitable data if required**

Q.No.	Questions	Points	Modul	BL	CO
Q.1.	Solve any four (each carries five marks)	20			
a	Discuss the Classification of pavement design methods		01	02	02
b	Criteria for selection of filter material in subsurface drainage system		06	02	02
c	Advantages and disadvantages of rigid pavements		03	01	02
d	Displacement equation for flexible plate and rigid plate		02	02	02
e	Enlist at least 10 types of distresses generally observed in pavements.		05	01	03
Q.2.					
a	Why layer system concept is developed in the design of flexible pavement. explain with sketch	08	02	02	01
b	Design the flexible pavements passing through plain area for two lane undivided carriageway, the traffic is allowed to move in both direction and design life of 12 years. Total numbers of heavy vehicles in both directions for undivided lane carriageway are 1000 cvpd, if rate of growth of traffic is 7 %, the CBR value of subgrade soil is 6 % and time required for construction of road after last count is 3 years. Use IRC 37- 1984 Guideline. Also, estimate the quantity of material required for construction of 1 km long road. Refer Table - I	12	02	03	02

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END SEMESTER EXAMINATION/RE-EXAMINATION

DECEMBER - 2024

Q.3.					
a	Explain the laboratory procedure for conducting the CBR test. How will you apply the correction to the CBR value?	10	02	03	02
b	Discuss the procedure for construction of WBM type base layer of the flexible pavements. (the discussion includes definition of WBM, gradation of materials, suitability of materials for the construction and construction procedure)	10	04	03	03
Q.4.					
a	State the equations for calculation of warping stress at interior, edge and corner of the rigid pavement slab due to daily variation of temperature	06	03	02	02
b	Discuss revised PRA Method for classification of subgrade soil.	07	02	02	03
c	Design the tie bar in longitudinal joint of cement concrete pavement having thickness 25 cm and width 3.5 m using the following Density of concrete = 2400 kg/cm^3, Allowable working stress in plain steel bar = 1250 kg/cm^2, Permissible bond stress in concrete = 17.5 kg/cm^2, Coefficient of friction = 1.2	07	03	03	03
Q.5.					
a	State the assumption of Burmister two and three layer theory	04	02	01	02
b	Discuss the procedure for construction of cement concrete slab by alternate bay method.	06	04	02	03
c	Design a rigid pavement using modified Westergaard's wheel load and warping stress equation at edge region of the slab. The design data are given in the table below. 1 Design wheel load — 5100 kg 2 Tyre pressure — 7 kg/cm^2 3 Spacing between longitudinal joints — 5.0 m 4 Spacing between transverse joint — 3.5 m 5 Modulus of elasticity of concrete — 3 * 10^5 kg/cm^2	10	03	04	02

END SEMESTER EXAMINATION/~~RE-EXAMINATION~~

DECEMBER - 2024

	6 Poisson's ratio 0.15 7 Flexural strength of concrete 45 kg/cm^2 8 Modulus of subgrade reaction of base 15 kg/cm^3 9 Coefficient of thermal expansion $10*10^{-6}$ per ^{0}C Maximum difference of temperature between top and bottom fiber during mid-day at the site under consideration is 14.30^{0}C.					
Q.6.						
a	Explain with neat sketch, why it is necessary to provide the surface drainage system on either side of road.		05	06	01	03
b	The Benkelman beam study were conducted on the stretch of 500 m long road section and 10 sets of observations were recorded and shown in table 1. If the least count of dial gauge used for the study is 0.01 calculate the rebound deflection. The traffic volume study shows that the road carries a traffic of 1600 cvpd on last count and three years required for construction after last count. The average temperature at the time of study is 40^{0}c, subgrade moisture factor is 1.2, VDF = 2.5, LDF = 1, rate of growth of traffic is 7 % and design life is 10 years. Design the (i) Bitumenous type overlay thickness, (ii) WBM type overlay thickness and (iii) Bitumenous concrete type overlay thickness		15	05	04	03
Q.7.						
a	How will you repair the following types of distresses (i) Longitudinal Rutting (ii) Longitudinal cracks		10	06	02	03
b	Design the Cement concrete pavement for rural road in coastel area carrying a traffic volume of 110 commercial vehicles per day. The CBR value of subgrade soil in the area through which road passing is 10		10			

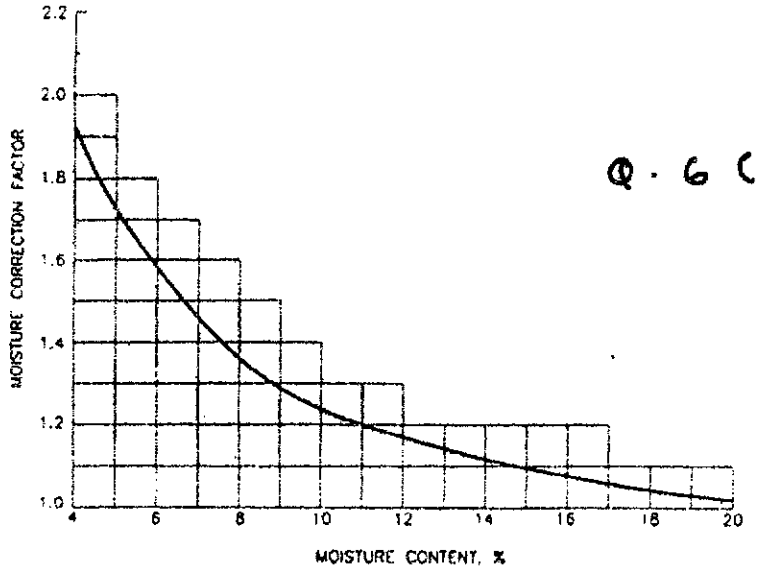
	percent. Maximum single axle load expected to pass on the road is 4500 kg and tyre pressure is 7 kg/cm^2. **Note: modulus of subgrade reaction for 10 percent CBR value (as per IRC :SP:62-2014) = 5.0 kg/cm^3.**				

Q. 7 (b), Table 1

Sets of observation	D_0	D_i	D_f
1	0	33	30
2	0	37	32
3	103	41	38
4	104	36	33
5	105	35	33
6	101	42	39
7	101	43	40
8	0	41	38
9	0	42	40
10	0	29	26

Q.2. (b) Table - I

Design traffic in msa	Minimum thickness of layers in mm		
	Surface	Base	Subbase
0.50	20 mm PC or 2 coats of SD	150 mm	T – 50, minimum thickness of 100 mm on subgrade of CBR less than 20 %
0.5 - 2	20 mm PC or MS	225 mm	T – 225, minimum thickness of 150 mm on subgrade of CBR less than 20 %
2 – 5	20 mm PC/MS/SDC over 50 mm/75 mm BM	250 mm	T – 300/325, minimum thickness of 750 mm on subgrade of CBR less than 30 %
5 – 10	20 mm BC/SDC over 60 – 80 DBM	250 mm	T – 335 to 355, minimum thickness of 750 mm on subgrade of CBR less than 30 %
10 – 15	40 mm BC over 65 – 80 DBM	250 mm	T – 335 to 370, minimum thickness of 750 mm on subgrade of CBR less than 30 %
15 – 20	40 mm BC over 80 – 100 DBM	250 mm	T – 370 to 390, minimum thickness of 750 mm on subgrade of CBR less than 30 %
20 – 30	40 mm BC over 100 – 115 DBM	250 mm	T – 390 to 405, minimum thickness of 750 mm on subgrade of CBR less than 30 %



Q. 6 (b)

Moisture correction factor for clayey subgrade with high plasticity (PI > 15) for low rainfall areas (Annual rainfall ≤ 1300 mm)

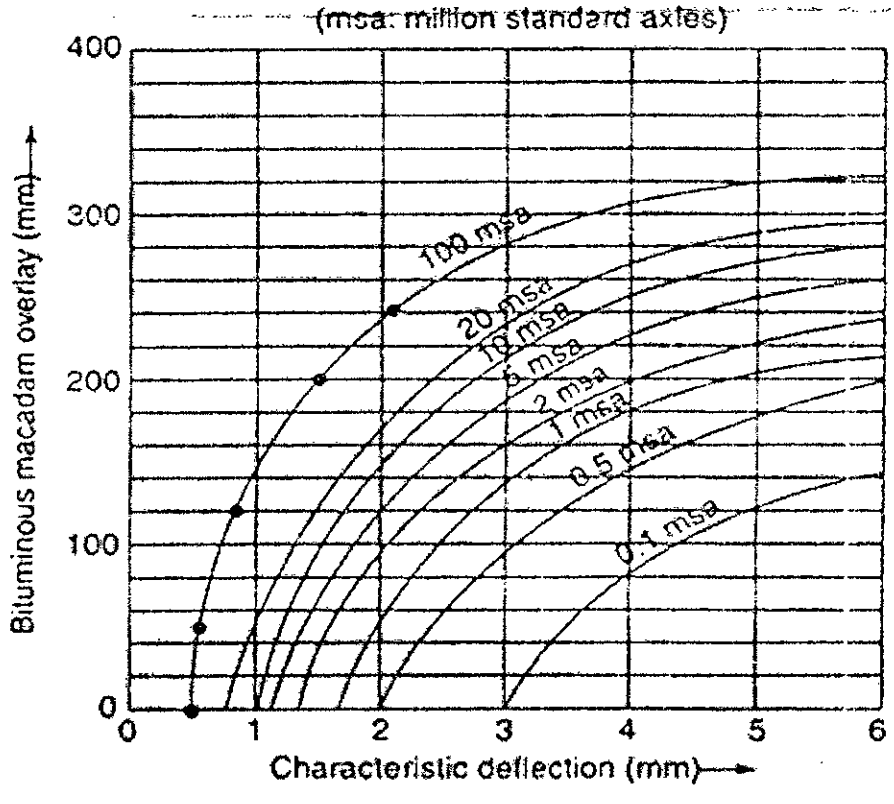


FIG 10.10 *Overlay thickness design curves (IRC: 81–1997)*

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END SEM/~~RE-EXAM~~ EXAMINATION DEC/~~JAN~~ 2024-25

7/12/24

Program: B.Tech Civil Engineering Sem VII **Duration: 3 hours**

Course Code: PE-BTC726 **Maximum Points:100**

Course Name: Prestressed concrete **Semester:VII**

Notes : ***Attempt any 5 main questions out of 7; Assume any missing data and state the same clearly; Illustrate your answers with neat sketches, Use of IS 1343 is allowed***

Q.No.	Questions	Points	CO	BL	Modu No.
1.a)	Discuss the advantages and disadvantages of prestressed concrete over reinforced concrete and steel structures	10	1	3	01
1.b)	A prestressed concrete beam is of size 500 mm × 900 mm. The beam is simply supported on a span of 12 m. It is subjected to a central concentrated load of 1500 kN and a UDL of 10 kN/m. A parabolice tendon is provided at an eccentricity of 100 mm below the centroidal axis and 50 mm below the centroidal axis at the ends. Compute the extreme stresses at midspan,quarter span and supports of the beam	10	1	1,2	01
2.a)	A prestressed concrete beam is of T section having flange width and thickness 750mm and 250mm respectively. The total depth is 1700mm. Thickness of web is 200mm. The area of prestressing steel is 1400mm2 . The prestressing steel is provided at a distance of 100mm from the soffit of the beam. If fck = 40MPa and fpu = 1700MPa, Calculate the ultimate flexural strength using IS CODE	10	3,5	3	03
2.b)	Design the shear reinforcement ***at quarter span*** for a simply supported beam of rectangular cross section 350mmx700mm and span 12m. It carries a live load UDL of 15kN/m(unfactored). It is prestressed by a straight cable that is having eccentricity of 200mm ; fck = 40MPa Effective prestress in cable = 1000MPa Characteristic strength of PT steel = 1600MPa Use Fe500 grade steel for reinforcement.	10	3,5	4	03
3.a)	A simply supported post tensioned beam of span 18m with 2 cables having a cross section of 300mm X 1000mm is successively tensioned from a single end in the order of cables1-2.	15	2,5	3	02

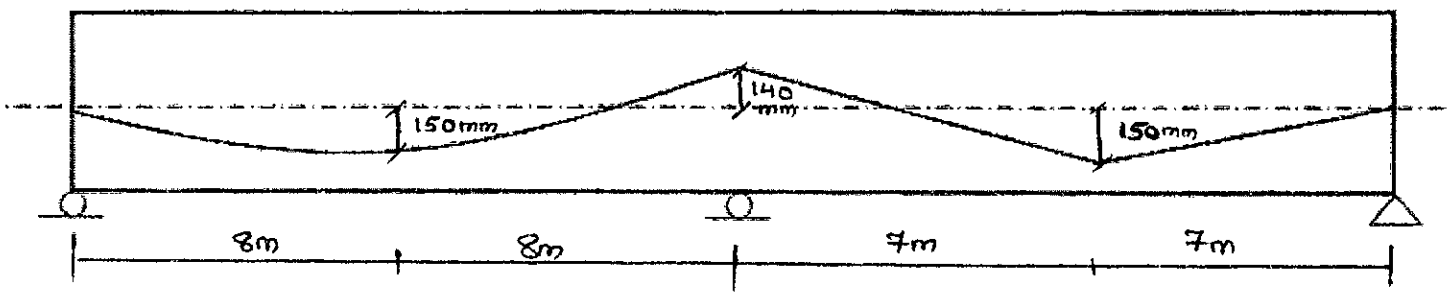
	Profile	Eccentricity at midspan	Eccentricity at support
Cable 1	Parabolic	200mm (below CG)	150mm (above CG)
Cable 2	Straight	450mm (below CG)	450mm (below CG)

END SEM/RE-EXAM EXAMINATION DEC/JAN 2024-25

	Each cable has a cross section area of 300mm^2 and an initial tension of 1250MPa and M45 is used for the beam. Co-efficient for friction = 0.5; co-efficient for wave effect = 0.0014/m. Age of concrete at transfer of prestress = 28days. Anchorage slip = 2.5mm. Es = 210kN/mm^2, Calculate the % losses due to elastic shortening, shrinkage (at 100days), friction and anchorage slip.				
3.b)	Explain the reason why early attempts at prestressing failed and how it was overcome?	5	1,3	2	02
4.	Design a Type 1 post tensioned bonded girder (simply supported) for the following data : Effective span = 17m; Live load = 22kN/m; fck = 40MPa; fci = 30MPa; Es = 210kN/mm^2 Assumed loss % = 35% Use 8mmϕ strands for cables. The characteristic strength of cables is 1600MPa. Calculate the size of section required, prestressing force, eccentricity with safe cable zone. Draw neat sketch of the cable profile	20	3,5	4	05
5.a)	The prestressed concrete beam consists of a precast beam (300x800mm) and cast in situ slab (1500x125mm). If the differential shrinkage is 1.35x10^{-4} find the shrinkage stresses at extreme fibres of slab and beam and sketch its variation across the depth. Use M35 grade of concrete.	08	4	3	06
5.b)	A 15m span simply supported composite beam consists of 250mmX750mm precast stem and a cast-in-situ flange of 900mmX200mm. The stem is a post tensioned unit subjected to a prestressing force of 1000kN. The tendons are provided at 150mm from the soffit of stem. The beam has to support a live load of 10kN/m. Determine the resultant stress distribution in the beam if the beam is unpropped	12	4	2	06
6.a)	i) Derive the value of deflection for a simply supported beam prestressed with parabolic cable –having eccentricity "e_1" at supports (above CG) and having eccentricity "e_2" at midspan (below CG). ii) A simply supported prestressed beam of cross section 300mmX600mm and span 8m has a straight profile of cable with eccentricity of 200mm below CG and a parabolic profile concentric at supports and having e=100mm at mid span. It carries a live load of 8kN/m. The area of each cable is 400mm^2 and it is initially tensioned to 1350N/mm^2. % losses = 25% Calculate the : i) Instantaneous deflection due to dead load + prestressing force ii) Long term deflection if the creep coefficient is 1.6 Es=210kN/mm^2; Ec =35kN/mm^2	10	1	3	03

END SEM/RE-~~EXAM~~ EXAMINATION DEC/~~JAN~~ 2024-25

6.b)	The end block of a post-tensioned beam has two anchorages with 300 mm diameter bearing plates located at 350mm from top and bottom respectively. The size of end block is 350x1050mm. An initial pre-stressing force of 800 kN is applied to each anchorage. Design the end zone reinforcement. Use Fe500	10	3,5	3,5	04
7.a)	The cable profile for a two span continuous beam is as shown in figure below. The prestressing force is 1500kN. Locate the pressure line due to prestressing force and a UDL of 40kN/m on full span	20	4	4	07



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END SEMESTER EXAMINATION-DEC-2024 7/12/24

B. Tech **SET-II**

Program: Civil Engineering Sem VII

Course Code: PE-BTC-743

Course Name: Industrial Wastewater Treatment

Duration: 3 hrs.

Maximum Points: 100

Semester: VII

Notes:

1. Q.1 is compulsory and attempt any 4 out of remaining
2. Illustrate answer with neat sketches wherever required.
3. Make suitable assumptions where necessary and state them clearly.

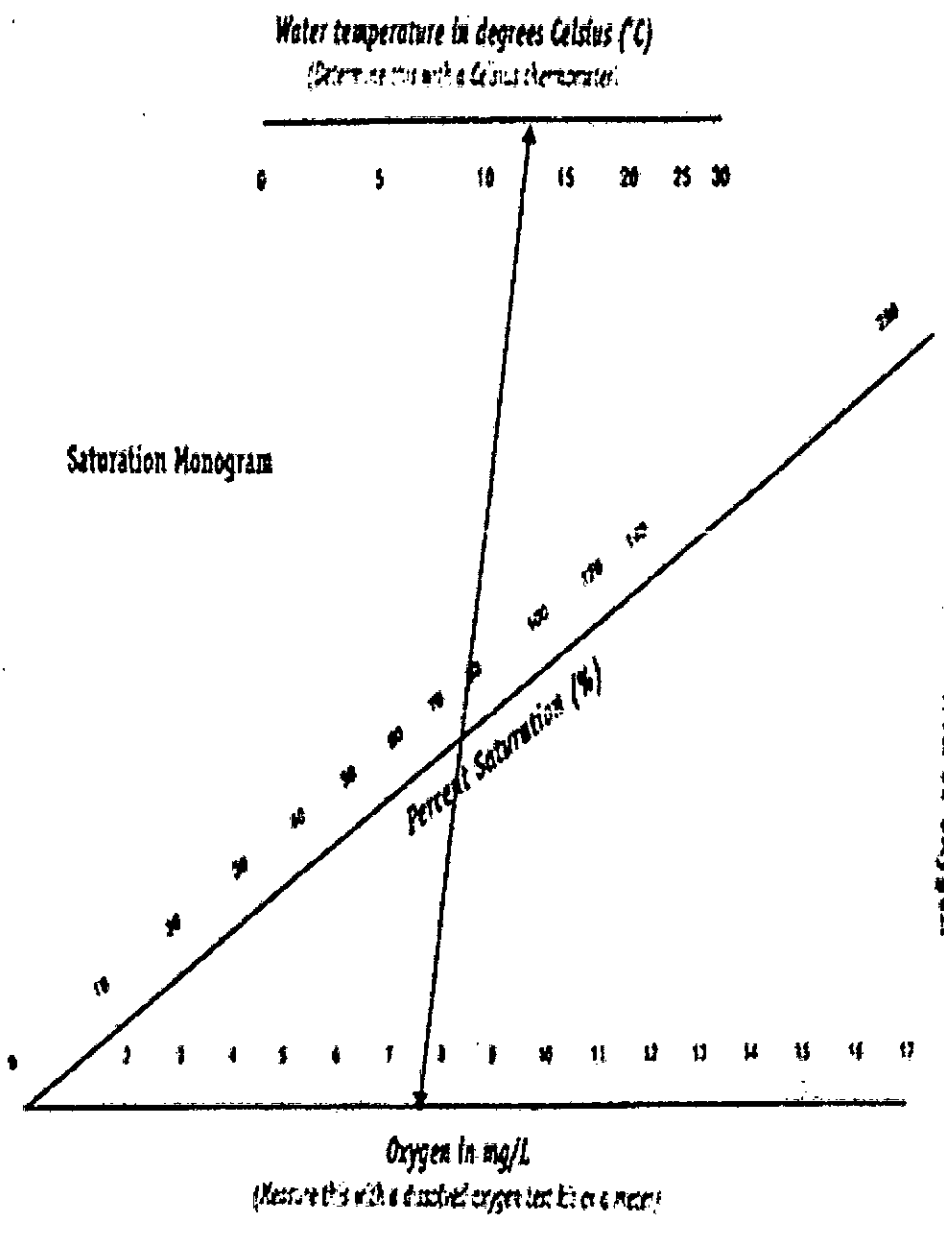
Q.No.	Questions	Points	BL	CO	Module No
1.	Write a short note on : (Any four) 1. Strength Reduction of Industrial waste. 2. Moving Bed Biofilm Reactor 3. Treatability Study 4. Domestic Wastewater Vs Industrial wastewater 5. Treatment Flow sheet for Tannery Industry 6. Equalization of Industrial waste.	20	1	1-3	1-7
2	A. Discuss the Minamata Tragedy which caused by illegal industrial effluent disposal on watercourses. B. Discuss the Membrane construction and characteristics. A city has population of 2 lakh and it has to be supplied at the rate of 240 liters per person per day. The hourly variation in demand is given in the table. Find out the capacity of the distribution reservoir to be provided for balancing the variable demand against a constant rate of pumping: i. When the pumping is done for all 24 hours. ii. When pumping is done from 6 am to 11 am and then 2 pm to 9 pm.	10+10	2	1-3	1

Period of days in hours	0 to 4	4 to 8	8 to 12	12 to 16	16 to 20	20 to 24
% of average hourly flow	16	70	190	88	166	70

3	1. Define: Neautralization of industrial waste. Also discuss the necessity and processes for industrial waste in detail. Also make a list of chemicals involved in reduce or increase pH in neutralization tank. 2. Derive streeter-phelps equation and Determine D.O. deficit profile for 80 km from the following data: Velocity of mix = 0.2 m/sec, R'=0.4, K' = 0.23. River: Q=0.6m3/s; BOD5@20°C =2 mg/l; T=20 °C; DO=8mg/l Flow from STP: Q=12000m3/d; BOD5@20°C =30 mg/l; T=26°C; DO=3mg/l	10+10	3	1-3	2,3
4	A. Discuss the Volume reduction measures for industrial waste along with examples. B. Discuss the stabilization, dewatering and disposal methods of industrial sludge in detail.	10 +10	2	1,2	3,5
5	A. Discuss the Nanofiltration, Ultrafiltration, Microfiltration, Electrodialysis and Reverse osmosis with their specifications. B. What do you mean by Sequencing Batch Reactor? Explain the basic treatment processes in SBR along with advantages and disadvantages.	10 + 10	3	2,4	4
6	A. Discuss the working principle, advantages and disadvantages of Rotating Biological Contactors (RBC) for industrial wastewater treatment. B. Define: Phytoremediation. Explain the various processes in Phytoremediation. C. Define: Constructed wetland. Enlist the plants used in constructed wetland to treat effluents.	10 +06 +04	2	2,4	4
7	A. Discuss the manufacturing process, wastewater sources, wastewater characteristics, and treatment flowsheet for traditional sugarcane-based sugar industry in detail. B. *"One-fifth of water pollution comes from textile dyes. But a shellfish-inspired solution could clean it up – CNN dated 23 june, 2023.* Discuss how the textile industry manufacture products with wastewater of specific characteristics, responsible for water pollution and possible treatment options currently employed by industry to tackle dyes issues.	10+ 10	2	1-3	6

Percent Saturation of Dissolved Oxygen

1. Determine water temperature in degrees C and find the value on the temperature scale.
   - F to C conversion: [(F – 32) x 5] ÷ 9
2. Determine dissolved oxygen (DO) and find the value on the lower scale (Note: you result can be in mg/L or ppm).
3. Using a straight edge (ruler, piece of paper etc.) draw a line from the temperature value to the dissolved oxygen value. The point at which the line crosses the middle (saturation scale) is the percent saturation of oxygen.



Solubility: Amount of DO that distilled water can hold at a given temperature

Temp. (C)	Solubility (mg/L)
0	14.6
1	14.2
2	13.8
3	13.5
4	13.1
5	12.8
6	12.5
7	12.2
8	11.9
9	11.6
10	11.3
11	11.1
12	10.9
13	10.6
14	10.4
15	10.2
16	10.0
17	9.8
18	9.6
19	9.4
20	9.2
21	9.0
22	8.9
23	8.7
24	8.6
25	8.4
26	8.2
27	8.1
28	7.9
29	7.8
30	7.7

> 90	85 - 75	74 - 60	< 60
Excellent	Good	Fair	Poor

Example: Determine the % saturation of dissolved oxygen in a stream given the following information: Temperature (13 C); DO (7.6 mg/L). Using the monogram above your answer would be about 72 - 75 depending on your line. Another method is to divide 7.6 by 10.6, which is the 100% solubility at 13 C, then multiply by 100. Your answer would be 71.7.

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End Semester Exam/~~Reexam~~
December 2024/~~January 2025~~

9/12/24

Max. Marks: 50+50 (project+report) **Duration: 2 Hrs**
Class: B. Tech Civil Sem VII **Semester: VII**
Name of the Course: Entrepreneurship Innovation and Design thinking Program: B. Tech
Course Code: OE BTC 712

Instructions:

- **Attempt any Five questions out of Seven**
- **Draw neat sketches/diagrams wherever required in the answer sheet and upload**
- **Assume suitable data if necessary and state them clearly**
- Figure on right indicate **maximum points** for the given question, **course outcomes attained, Bloom's Level** and **Performance Indicators**

	Answer the questions	**Marks**	**CO**	**BL**
Q1	Answer the following questions based on the case study on Ather Energy article:	(10)	1-2	4
Q(a)	Analyze and evaluate Ather's journey from a 2 person to 350+ strong company and path of finally having a viable product ready for market launch	(05)	2,3	3
Q(b)	Discuss opportunities and challenges for Ather Energy. How can Ather Energy ensure it's sustainability	(05)	1,2	3
Q2	Based on The case study of organic wellness is shared to you. Answer the questions based on the study.	(10)	2,3	4
Q(a)	Analyze the long term viability of various strategies adopted by Guptaa to keep farmers interested in agriculture as a profession.	(2.5)		
Q(b)	Briefly discuss the marketing tactics employed by Guptaa and how it helped to generate customers	(2.5)	2,3	3
Q(c)	Critically analyze the social media campaign led by Guptaa. With the organic market expanding, can he compete using zero sales force? Recommend a strategic marketing plan for Gupta considering hypothetical market of US $50000.	(05)	4	3
Q (3)	Explain in minimum 350-400 words what are the key ingredients for a start up to be successful according to the book zero to one.	(10)	2,3	3

Q(4)	Explain the major steps for design thinking and how to go about these steps. Which according to you is most important and why?	(10)	2,3,4	3
Q(5)	**Explain in short**	**(10)**	2,3	4
(i)	What are assets, liabilities and equity and where are they used ?Give an equation linking them	(05)		
(ii)	Consider two companies (a) Screw manufacturer (b) nanoparticle manufacturing for paints. Which of the two is a start up? Which of the two is most likely to be invested by a bank loan and which one will be invested by venture capitalist and why?	(05)		

ALL THE BEST

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9/12/24

End Semester Examination

B.Tech **December 2024**

Program: Civil Engineering Sem VII
Course Code: PC – BTC713
Course Name: Disaster Management & Preparedness

Duration: 3 hours
Maximum Points: 100
Semester: VII

Instructions:

1. **Question no.1 is compulsory.**
2. Solve **any FOUR** from the remaining SIX questions.
3. Write answer to each question on a new page.
4. Answers to be accompanied with appropriate sketches, tables, and charts wherever necessary or required

Q.No.	Question	Points	CO	BL
1	a. Define hazard and vulnerability in the context of disasters and explain how they contribute to the risk. (4)	20	1,2,3,4,5	1
	b. Discuss the role of climate change in increasing the frequency of urban disasters. (3)			2
	c. Define the disaster management cycle and briefly describe its four main phases with examples. (6)			1
	d. List the key environmental modifications caused by urbanization that increase disaster vulnerability, with brief examples. (4)			1
	e. Define the terms Disaster Response and Disaster Mitigation. Provide one example of each. (3)			1
2	a. Classify any two natural disasters and describe their causes and impacts with suitable examples. Include recent case studies to support your answer. (10)	20	1,2,3	3
	b. Explain in brief the moving agenda of Global disaster risk reduction (DRR). (5)			3
	c. Discuss the formation and the structure of National Disaster management Authority (NDMA) in India. (5)			3
3	Develop a comprehensive disaster management plan for floods caused by heavy rainfall in a study area of your choice, integrating findings from rainfall trend and pattern analysis. 1. Based on your analysis, design a plan detailing specific actions for each phase of disaster management: Mitigation, Preparedness, Response, and Recovery. (10) 2. Identify and explain how technologies such as GIS, remote sensing, or others can be utilized in your plan. (5)	20	3,4,5	3

End Semester Examination

December 2024

	3. Evaluate the strengths and limitations of your disaster management plan. (5)			
4	a. Discuss the earthquake hazard and vulnerability profile of India, focusing on its mountain regions. (4)	**20**	3,4,5	2
	b. Highlight the challenges posed by ecological fragility for earthquake hazards and provide recommendations for disaster management strategies. (4)			2
	c. Analyze the global and national disaster trends and discuss their links to climate change. (8)			3
	d. Highlight the specific challenges faced by urban areas in managing disasters. (4)			3
5	a. Analyze the impact of construction work of metro rail line in Mumbai city on disaster vulnerability. Discuss how sustainable methods can address these vulnerabilities while ensuring environmental protection. (8)		3,5	3
	b. Explain in detail how hazard mapping tool can be used for analyzing a wildfire. (12)			3
6	a. Differentiate between disaster prevention and disaster mitigation with examples. (4)	**20**	2,3,5	2
	b. Identify two psycho-social issues that arise after a disaster and suggest one measure to address each. (3)			3
	c. Differentiate between structural and non-structural measures in disaster mitigation, providing two examples of each. (6)			1
	d. Explain how land use changes can affect the vulnerability of communities to disasters, using a relevant case study. (4)			2
	e. State the process of a risk analysis as per IS 15656: 2006. (3)			1
7	a. Explain the terms exposure and vulnerability in the context of natural disasters and explain, with proper example, how they are related. (4)	**20**	3,4,5	2
	b. Explain how disasters impact the environment and economy, providing one example of each. (3)			1
	c. Explain the importance of early warning systems in disaster management. Discuss how they contribute to reducing risk and improving preparedness, using real-world examples. (6)			3
	d. Suggest two sustainable and environmentally friendly recovery methods after a flood. How can these methods help prevent future disasters? (4)			3
	e. State different methods of qualitative and quantitative risk assessment. (3)			1

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END SEM/~~RE~~-EXAM. EXAMINATION DEC/~~JAN~~ 2024-~~25~~

Program: B.Tech. Civil/Mechanical/Electrical Engineering (UG) **Duration: 03 Hrs.**

Course Code: OE-BTC-714 **Maximum Points: 100**

Course Name: Engineering System and Development **Semester: VII**

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 No.
1	(a)Discuss: role of Engineers in Society, Basics of Engineering Profession and Role of Engineering services in economic development.	10	1	2	1
	(b)Explain the role of following sectors in national development: (i) Energy, (ii)Agriculture, (iii)Industry; and (iv)Infrastructure	10	2	3	1
2	(a)Explain various steps in engineering processes with an example and case study.	10	1	2	2
	(b) You are one of the team members of an engineering team for construction and development of an Airport for connectivity. Discuss Engineering functions and expected essential roles of team members.	10	3	4	2
3	(a) Define: Sustainable Development. Discuss elements of sustainability and justify how it is interdisciplinary.	10	1	2	2
	(b) Differentiate between Equity and Equality. Discuss Sustainable development and economic growth.	10	2	3	2
4	(a) Explain in brief ecosystem-based decision making model and importance of integrated decision-making in development.	10	1	2	3
	(b) What is Human Development Index (HDI)? What it measures? Explain how HDI is calculated using four indicators.	10	2	4	3
5	(a) Write short notes on: National Institution for Transforming India (NITI-Aayog). Express your views on HRD, Skill Development & Employment and Rural Development.	10	2	2	4
	(b)What is development engineering? Discuss its role in development of community services, water pipe networking, education and health services.	10	3	5	4
6	(a)What is the role of manufacturing sector with respect to local and global scenario? Discuss the effect of seasonal variation on	10	2	4	5

	development.				
	(b)What is your opinion on: importance of digitization and communication in development? Explain with case study.	10	1	2	5
7	(a)Discuss the role of good governance in overall development of the society.	10	2	3	6
	(b)What the word paradigm indicates? Explain classical model of development and growth stage theory.	10	3	5	6

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EXTC Dept
B Tech Civil - Sem VII

4/12/24

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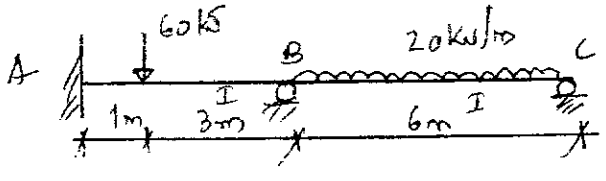
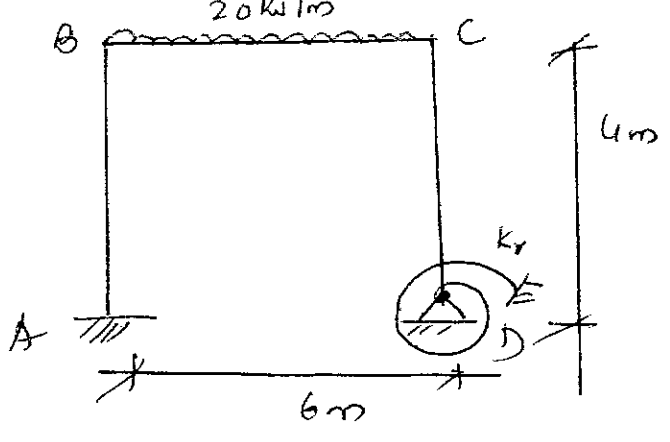
End Semester Examination
December - 2024

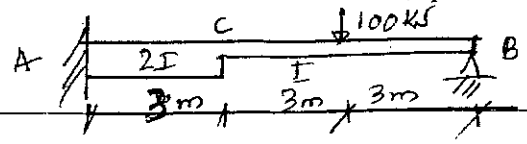
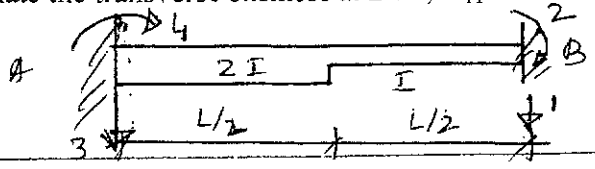
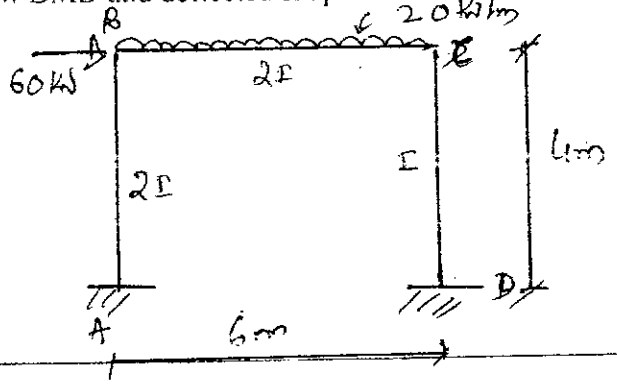
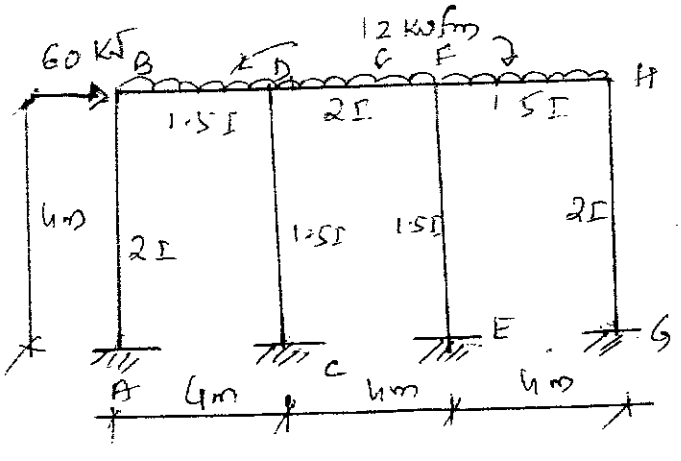
Max. Marks: 100
Class: B.Tech. Sem VII Civil Semester: VII
Name of the Course: Advanced Structural Analysis

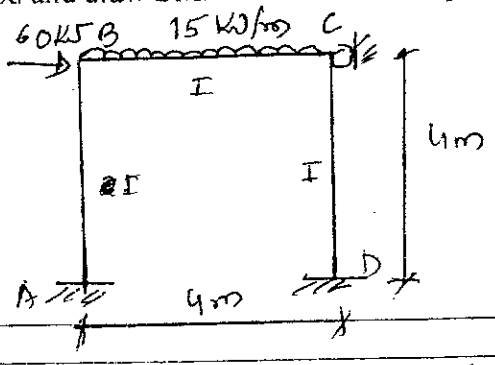
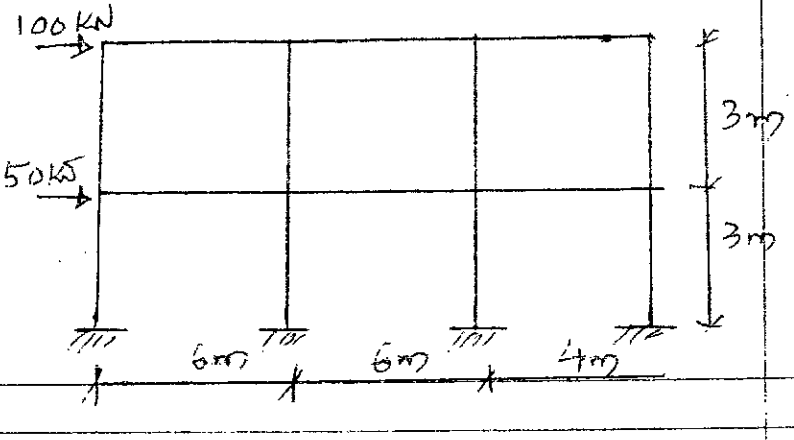
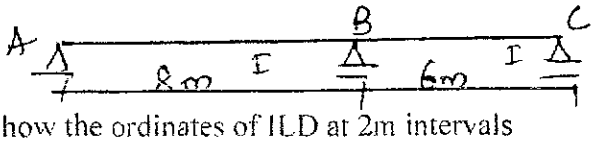
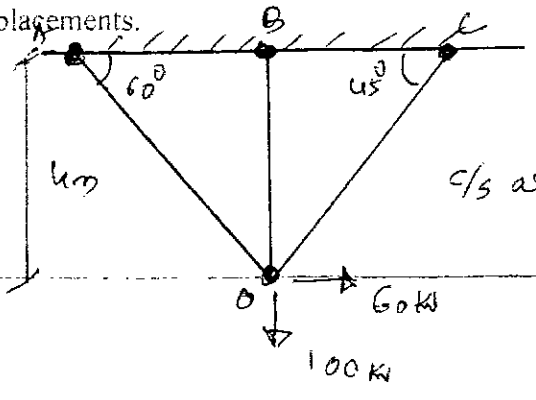
Duration: 3Hours
Program: Civil Engineering
Course Code : PEC- BTC721

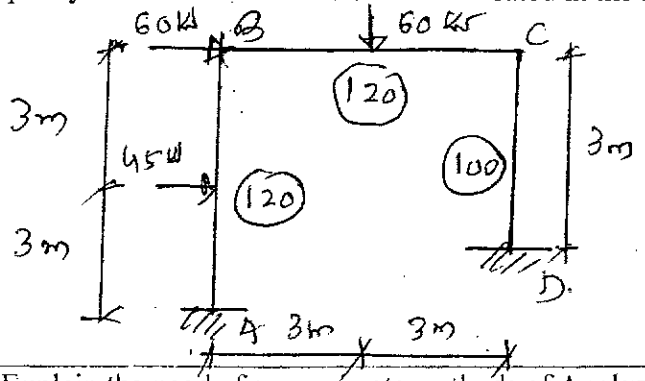
Instructions:

- Answer to any five questions
- Answers to all sub questions should be grouped together.
- Figures to the right indicate full marks.
- Assume suitable data if necessary and state the same clearly.

Question No		Max. Marks	Course outcome	Module No.
Q1 (a)	Analyse the beam shown in figure by Matrix Stiffness method and draw BMD & deflected shape. 	10	1,6	2
Q1 (b)	Analyse the rigid jointed frame shown in Figure by flexibility method and draw BMD and deflected shape. Note that D supported on elastic foundation, which allows partial rotation and no vertical and horizontal displacements. EI = 2 X 10^4 KN-m^2 and K_r= 10^4 KN-m/rad. 	10	2	4

Q 2 (a)	Using Column Analogy Method, analyse the beam shown in figure and draw BMD and Deflected shape. 	10	2	4
Q2 (b)	For the non-prismatic beam element shown in figure calculate the transverse stiffness at B i.e, K_{11}. 	10	2	4
Q 3(a)	(i) Derive the modified stiffness and carry over factor for a symmetric beam (axis of symmetry passing through center of beam) subjected to Anti symmetric loads (ii) Explain symmetric structure and state its advantages	2 2	1 1	3 3
Q3 (b)	Analyse the frame shown in figure by Elastic Centre Method and draw BMD and deflected shape. 	16	2	4
Q4	Analyse the frame shown in figure by Modified Moment Distribution Method and draw SFD, BMD & deflected shape 	20	1	3

Q5(a)	Analyse rigid jointed plane frame shown in figure by Matrix Stiffness Method and draw BMD and deflected shape. 	10	1,6	2
Q5(b)	Analyse the frame shown in figure by Portal Method and draw SFD, BMD and deflected shape. 	10	3	6
Q6(a)	(ii) State Muller Breslau's Principle	1	5	5
Q6(b)	For the beam shown in figure, construct the ILD for: (i) Reaction at 'A' R_A (ii) Bending Moment at B 'M_B'  Show the ordinates of ILD at 2m intervals	10	4	5
Q6(c)	Analyse pin jointed plane frame shown in figure by Matrix Stiffness Method and calculate the member forces and member displacements.  c/s area for all members = 1000 mm² E = 2×10⁵ N/mm²	9	1, 6	2

Q7(a)	Using plastic analysis, determine the load factor for the frame loaded as shown in figure. The Plastic Moment capacity of each member in KN-m is indicated in the figure.  	16	5	7
Q7(b)	i) Explain the need of approximate methods of Analysis (ii) For the beam shown in figure, calculate the stiffness matrix w.r.t the co-ordinates shown in figure	2 2	3 1	6 1

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END SEM ~~RE-EXAM~~ EXAMINATION DEC/~~JAN 2024-25~~

Program: Civil Engineering B Tech Civil Sem VII **Duration: 3hr**

Course Code: PE-BTC751 **Maximum Points: 100**

Course Name: Engineering Risk and Uncertainty **Semester: VII**

7/12/24

Instructions:

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	Mod
1	It is proposed to construct a bridge across a perennial river. (i) Discuss the steps in the risk management process for the construction of a bridge along with flow chart. (ii) List the different risks which are likely to occur during the life cycle of a project. (iii) Brief the consequence and mitigation measures for the different risks. (iv) Discuss the contents of a typical risk register for the bridge construction project.	20	CO	BL3	1,2 &3
2(a)	Discuss the role of insurance in the context of risk management.	10	CO1	BL2	2
2(b)	Explain in depth the process of risk assessment along with process flow chart as per IS 15883 (Part 8): 2015.	6	CO1	BL2	3
2(c)	Brief about the need of development of Hybrid annuity model	4	CO1	BL2	7
3(a)	A company has received quotes for its recent advertisement for the purchase of a sophisticated milling machine. The data are as per the estimate in today's rupee value.	10	CO1	BL3	2&3

	Machine X	Machine Y
Purchase price (Rs.)	15,00,000	20,00,000
Machine life (years)	7	7
Salvage value at the end of machine life (Rs.)	2,00,000	3,00,000
Annual operating & maintenance cost (Rs.)	3,00,000	2,50,000

Assuming an average annual inflation of 5% for the next five years, determine the best machine based on the present worth method. Interest rate is 15%, compounded annually

3(b)	Discuss RPN and its significance in risk management process.	4	CO1	BL1	3
3(c)	Discuss the typical financial risks in the context of highway construction projects.	6	CO1	BL2	7
4(a)	Discuss the various techniques used for quantitative risk analysis	7	CO1	BL2	2
4(b)	Discuss the crisis management plan and brief about its features in the process of risk management.	6	CO1	BL2	7
4(c)	The details of the feasibility report of a project are as shown below.	7	CO1	BL3	4
	Check the feasibility of the project based on present worth method, using i = 20%. Initial outlay = Rs. 50,00,000 Life of the project = 20 years. Annual equivalent revenue = Rs. 15,00,000 Modernizing cost at the end of the 10th year = Rs. 20,00,000 Salvage value at the end of project life = Rs. 5,00,000.				
5(a)	Discuss the common causes for the time and cost overruns in case of the toll road construction projects.	6	CO1	BL1	7
5(b)	A glass factory that specializes in crystal is developing a substantial backlog and for this the firm's management is considering three courses of action:	10	CO1	BL3	5
	To arrange for subcontracting (S1), to begin overtime production (S2), and to construct new facilities (S3). The correct choice depend largely upon the future demand, which may be low, medium or high. By consensus, management ranks the respective probabilities as 0.10, 0.50 and 0.40. A cost analysis reveals the effect upon the profits. This is shown as below				

Demand	Probability	Course of action		
		S1 (Subcontracting) in thousands of Rs.	S2 (Begin Overtime) in thousands of Rs.	S3 (Construct Facilities) in thousands of Rs.
Low(L)	0.1	10	-20	-150
Medium(M)	0.5	50	60	20
High(H)	0.4	50	100	200

	Draw decision tree diagram. Indicate the most preferred decision and corresponding expected value.				
5(c)	Explain failure mode effect analysis (FMEA)	4	CO1	BL1	3
6(a)	A vitrified tile company keeps a stock of popular stock of tile.	9	CO1	BL3	6
	Previous experience shows the daily demand for the item with associated probabilities as given below:				

Daily demand (number)	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

	Using random numbers: 25, 39, 65, 76, 12, 05, 73, 89, 19 and 49, simulate the demand for next 10 days. Also estimate the daily demand distribution.				
6(b)	Discuss in brief about advantages of HAM compared to BOT PPP Model in the context of risk management.	6	CO3	BL2	7
6(c)	A manufacturing firm produces a single product whose selling price is ₹ 150 per unit and the variable costs per unit are ₹ 50 per unit. If the annual fixed costs of the firm are estimated as ₹ 5,00,000. Find the breakeven point in units, in ₹ and as a % capacity if the firm has an estimated capacity of 10,000 units of the product. What is margin of safety?	5	CO1	BL3	4

<table>
<tr><td rowspan="2">7(a)</td><td>M/S Krishna Castings Ltd. is planning to replace its annealing furnace.</td><td>10</td><td>CO1</td><td>BL3</td><td>5</td></tr>
<tr><td colspan="5">It has received tenders from three different original manufacturers of annealing furnace. The details are as follows:
<table>
<tr><td></td><td colspan="3">Manufacturer</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>Initial cost (Rs.)</td><td>80,00,000</td><td>70,00,000</td><td>90,00,000</td></tr>
<tr><td>Life (years)</td><td>12</td><td>12</td><td>12</td></tr>
<tr><td>Annual operation and maintenance cost</td><td>8,00,000</td><td>9,00,000</td><td>8,50,000</td></tr>
<tr><td>Salvage value after 12 years</td><td>5,00,000</td><td>4,00,000</td><td>7,00,000</td></tr>
</table>
Which is the best alternative based on future worth method at i = 20%?</td></tr>
<tr><td>7(b)</td><td>You are carrying out construction work of Cement Concrete road in a corporation area. List different risks which likely to occur in such project during all phases of the project along with their mitigation measures.</td><td>10</td><td>CO1</td><td>BL3</td><td>1,2 & 3</td></tr>
</table>

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Re January 2025

~~TERM END~~ EXAMINATION DE~~CEMBER 2024~~

13/1/25

Program: B. Tech (Civil) Sem VII **Duration: 3 Hr**

Course Code: PC-BTC701 **Maximum Points: 100**

Course Name: Design of concrete structure **Semester: VII**

Notes: Question no. 1 compulsory Solve any ~~4~~ four questions out of remaining question.

Q.No.	Questions	Points	CO	BL	Modu No.
1 (a)	Explain different types of joints provided in water tank construction with proper sketches	05	CO1	02	06
1 (b)	Explain difference between structural behavior of cantilever and counterfort retaining wall.	05	CO1	02	05
1(c)	Why Ductile detailing, as outlined in IS 13920:2016, is crucial even when a structure is designed using IS 1893, which considers seismic loads. **Explain in detail**	10	CO3	02	04
2(a)	Design a staircase block dimensions for dog legged staircase case to be provided for floor to floor height of 3.15 M. Design flight of dog legged staircase from floor slab to mid landing slab The Live load on slab is 5.0 kn/m2, floor finish is 1.0 kn/m2 in addition to self-weight of slab. Use M20 concrete and Fe 415 steel. **Draw a section to the scale showing reinforcement details.**	15	CO1/CO2/ CO3	03	01
2(b)	What is the meaning of ductile detailing and where it is mandatory as per IS codes	05	CO3	03	04
3	For a cantilever retaining wall **retaining soil backfill with surcharge of 40 Kn/m2** , of height 4.0 m above toe side ground floor. The good soil strata is available at depth of 1.25 m with SBC of soil as 160 kn/m^2. The angle of shearing resistance for soil is 30^0, Unit weight of soil is 16 Kn/m^3 Coefficient of friction between soil and concrete is 0.5. Use M20 concrete and Fe 415 steel. **Perform stability checks.** **Design Heel slab only.** **Draw a section to the scale showing reinforcement details.**	20	CO1/CO2/ CO3	03	05

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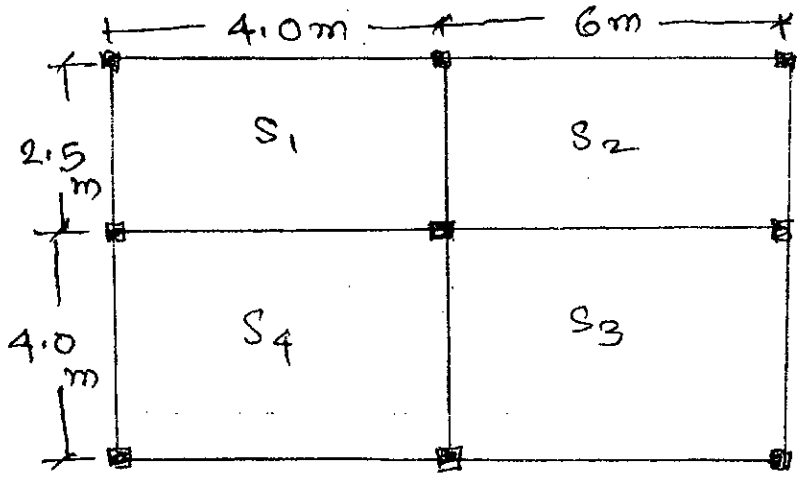
4(a)	Design interior panel of flat slab with drop, of c/c distance between columns 7.0 m in both directions. Use floor finish load as 1.0 Kn/m^2 and live load 4.0 Kn/ m^2 .size of column 450 mm x 450 mm. Use M40 concrete and Fe 415 steel. **Use direct design method Design for moments, shear check required.** **Draw reinforcement in plan clearly marking bottom and top reinforcement**	17	CO1/CO2/ CO3	03	02
4(b)	Explain why flat slabs are not provided in high seismic zones	03	CO1	02	02
5(a)	For the slab arrangement shown, calculate final design moments after balancing. Slab is subjected to floor finish load as 1.0 Kn/m^2 and live load 2.50 Kn/m^2 . Design reinforcement. Use M20 grade of concrete and Fe 415 steel. Draw a section AA 	12	CO1/CO3	03	03
5(b)	Design circular water tank with **flexible base joint** for 550,000 liters resting on ground and open at top. Use M30 grade concrete and Fe 415 grade steel	08	CO1/CO3	03	06
6(a)	Design circular water tank with **rigid fixed joint at base** for height of tank 7.0 m and diameter of tank 15 m resting on ground and open at top. Use M30 grade concrete and Fe 415 grade steel. **Use IS 3370 code coefficients for moment and shear calculations. Draw sectional elevations showing reinforcement details.**	14	CO1/CO2/ CO3	03	07

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6(b)	Design axially loaded column to carry 1500 Kn load. Effective height of column 3.2 M . Use M 20 grade of concrete and Fe 415 reinforcement. Use LSM for design. Draw section and elevation showing reinforcement if column is required to satisfy ductile detailing as per IS 13920	06	CO1/CO3	03	04
7	Design rectangular water tank resting on ground open at top of size 4.50 m x 6.00 m in plan and height 3.5 m . Free board is 150 mm using approximate analysis. **Calculate the reinforcement using M 30 concrete and Fe 415 steel. Draw reinforcement in plan and also in sectional elevation.**	20	CO1/CO2/ CO3	03	07

Pg3

Table 5 Ring Tension Coefficients for Case 2 Arrangement

(*Table* 1, *Clauses* 3.1 *and* 3.1.6)

H^2/Dt	Coefficients at Point (*see* Notes 1 and 2 at the end of Table 5A)									
	0.0*H*	0.1*H*	0.2*H*	0.3*H*	0.4*H*	0.5*H*	0.6*H*	0.7*H*	0.8*H*	0.9*H*
0.4	+0.582	+0.505	+0.431	+0.353	+0.277	+0.206	+0.145	+0.092	+0.046	+0.013
0.8	+1.052	+0.921	+0.796	+0.669	+0.542	+0.415	+0.289	+0.179	+0.089	+0.024
1.2	+1.218	+1.078	+0.946	+0.808	+0.665	+0.519	+0.378	+0.246	+0.127	+0.034
1.6	+1.257	+1.141	+1.009	+0.881	+0.742	+0.600	+0.449	+0.294	+0.153	+0.045
2.0	+1.253	+1.144	+1.041	+0.929	+0.806	+0.667	+0.514	+0.345	+0.186	+0.055
3.0	+1.160	+1.112	+1.061	+0.998	+0.912	+0.796	+0.646	+0.459	+0.258	+0.081
4.0	+1.085	+1.073	+1.057	+1.029	+0.977	+0.887	+0.746	+0.553	+0.322	+0.105
5.0	+1.037	+1.044	+1.047	+1.042	+1.015	+0.949	+0.825	+0.629	+0.379	+0.128
6.0	+1.010	+1.024	+1.038	+1.045	+1.034	+0.986	+0.879	+0.694	+0.430	+0.149
8.0	+0.989	+1.005	+1.022	+1.036	+1.044	+1.026	+0.953	+0.788	+0.519	+0.189
10.0	+0.989	+0.998	+1.010	+1.023	+1.039	+1.040	+0.996	+0.859	+0.591	+0.226
12.0	+0.994	+0.997	+1.003	+1.014	+1.031	+1.043	+1.022	+0.911	+0.652	+0.262
14.0	+0.997	0.998	+1.000	+1.007	+1.022	+1.040	+1.035	+0.949	+0.705	+0.294
16.0	+1.000	0.999	+0.999	+1.003	+1.015	+1.032	+1.040	+0.975	+0.750	+0.321

Table 5A Supplementary Ring Tension Coefficients for Case 2 Arrangement

(*Tables* 1 and 5, *Clauses* 3.1 *and* 3.1.6)

H^2/Dt	Coefficients at Point (*see* Notes 1 and 2)				
	0.75*H*	0.80*H*	0.85*H*	0.90*H*	0.95*H*
20	+0.949	+0.825	+0.629	+0.379	+0.128
24	+0.986	+0.879	+0.694	+0.430	+0.149
32	+1.026	+0.953	+0.788	+0.519	+0.189
40	+1.040	+0.996	+0.859	+0.59	+0.226
48	+1.043	+1.022	+0.911	+0.652	+0.262
56	+1.040	+1.035	+0.949	+0.705	+0.294

NOTES

1 Positive sign indicates tension.

2 The point, 0.0 *H* denotes the top of the tank and the point, 1.0 *H* denotes the base of the tank.

Table 6 Moment Coefficients for Case 2 Arrangement

(*Table* 1, *Clauses* 3.1 *and* 3.1.6)

H^2/Dt	Coefficients at Point (*see* Notes 1 and 2 at the end of Table 6A)									
	0.1*H*	0.2*H*	0.3*H*	0.4*H*	0.5*H*	0.6*H*	0.7*H*	0.8*H*	0.9*H*	1.0*H*
0.4	-.002 3	-.009 3	-.022 7	- 043 9	- 071 0	-.101 8	-.145 5	-.200 0	-.259 5	-.331 0
0.8	.000 0	-.000 6	-.002 5	- 008 3	-.018 5	-.036 2	-.059 4	-.091 7	-.132 5	-.183 5
1.2	+.000 8	+.002 6	+.003 7	+.002 9	-.000 9	-.008 9	-.022 7	-.046 8	-.081 2	-.117 8
1.6	+.001 1	+.003 6	+.006 2	+ 007 7	+ 006 8	+.001 1	-.009 3	-.026 7	-.052 9	- 087 6
2 0	+.001 0	+.003 6	.006 6	+.008 8	+.008 9	+.005 9	-.001 9	-.016 7	-.038 6	- 071 9
3.0	-.000 7	+.002 6	+.005 1	+.007 4	+ 009 1	+ 008 3	- 004 2	-005 3	-.022 3	- 048 3
4.0	+.000 4	+.001 5	+.003 3	+ 005 2	+ 006 8	+ 007 5	-.005 3	-.001 3	-.014 3	-.036 5
5.0	-.000 2	+.000 8	+.001 9	+.003 5	+ 005 1	+.006 1	-.005 2	+ 000 7	-.010 3	-.029 3
6.0	+.000 1	+.000 4	+.001 1	+.002 2	+.003 6	+.004 9	-.004 8	+.001 7	-.007 3	-.024 2
8.0	000 0	+ 000 1	+.000 3	+ 000 8	+ 001 8	+ 003 1	-.003 8	+.002 4	-.004 0	-.018 4
10 0	000 0	-.000 1	000 0	+ 000 2	+ 000 9	+.002 1	+ 003 0	+.002 6	-.002 2	-.014 7
12.0	000 0	.000 0	- 000 1	.000 0	+.000 4	+.001 4	+.002 4	+.002 2	-.001 2	-.012 3
14.0	000 0	.000 0	.000 0	000 0	+ 000 2	+.001 0	+.001 8	+.002 1	-.000 7	- 010 5
16.0	000 0	.000 0	.000 0	-.000 1	+.000 1	+.000 6	+.001 2	+.002 0	-.000 5	-.009 1

Table 6A Supplementary Moment Coefficients for Case 2 Arrangement

(*Tables* 1 and 6, *Clauses* 3.1 *and* 3.1.6)

H^2/Dt	Coefficients at Point (*see* Notes 1 and 2)				
	0.80*H*	0 85*H*	0.90*H*	0.95*H*	1.00*H*
20	+ 001 5	+ 001 3	+.000 2	- 002 4	-.007 3
24	+.001 2	+.001 2	+.000 4	- 001 8	-.006 1
32	+.000 8	+.000 9	+.000 6	- 001 0	- 004 6
40	+.000 5	+.000 7	+.000 7	- 000 5	-.003 7
48	+.000 4	-.000 6	+ 000 6	- 000 3	-.003 1
56	+.000 2	+.000 4	+.000 5	- 000 1	-.002 6

NOTES

1 Positive sign indicates tension in the outside

2 The point, 0.0 *H* denotes the top of the tank and the point, 1 0 *H* denotes the base of the tank.

TABLE 8 MOMENT COEFFICIENTS FOR INDIVIDUAL WALL PANEL, TOP FREE, BOTTOM AND VERTICAL EDGES FIXED- *Contd*

b/a	x/a	$y = 0$		$y = b/4$		$y = b/2$	
		M_x	M_y	M_x	M_y	M_x	M_y
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1·75	0	0	+0·025	0	+0·007	0	−0·050
	1/4	+0·012	+0·022	+0·005	+0·008	−0·010	−0·052
	1/2	+0·016	+0·016	+0·010	+0·009	−0·009	−0·046
	3/4	−0·002	−0·005	+0·001	−0·004	−0·005	−0·027
	1	−0·074	−0·015	−0·050	−0·010	0	0
1·50	0	0	+0·021	0	+0·005	0	−0·040
	1/4	+0·008	+0·020	+0·004	+0·007	−0·009	−0·044
	1/2	+0·016	+0·016	+0·010	+0·008	−0·008	−0·042
	3/4	−0·003	−0·006	+0·003	−0·004	−0·005	−0·026
	1	−0·060	−0·012	−0·041	−0·008	0	0
1·25	0	0	+0·015	0	+0·003	0	−0·029
	1/4	+0·005	+0·015	+0·002	+0·005	−0·007	−0·034
	1/2	+0·014	+0·015	+0·008	+0·007	−0·007	−0·037
	3/4	+0·006	+0·007	+0·005	+0·005	−0·005	−0·024
	1	−0·047	−0·009	−0·031	−0·006	0	0
1·0	0	0	+0·009	0	+0·002	0	−0·018
	1/4	+0·002	+0·011	+0·000	+0·003	−0·005	−0·023
	1/2	+0·005	+0·013	+0·005	+0·005	−0·005	−0·029
	3/4	+0·008	−0·008	+0·005	+0·004	−0·004	−0·020
	1	−0·035	−0·007	−0·022	−0·005	0	0
0·75	0	0	+0·004	0	+0·001	0	−0·007
	1/4	+0·001	+0·008	+0·000	+0·002	−0·002	−0·011
	1/2	+0·005	+0·010	+0·002	+0·003	−0·003	−0·017
	3/4	+0·007	+0·007	+0·003	+0·003	−0·003	−0·013
	1	−0·024	−0·005	−0·015	−0·003	0	0
0·50	0	0	+0·001	0	+0·000	0	−0·002
	1/4	+0·000	+0·005	+0·000	+0·001	−0·001	−0·004
	1/2	+0·002	+0·006	+0·001	+0·001	−0·002	−0·009
	3/4	+0·004	+0·006	+0·001	+0·001	−0·001	−0·007
	1	−0·015	−0·003	−0·008	−0·002	0	0

TABLE 3 MOMENT COEFFICIENTS FOR INDIVIDUAL WALL PANEL, TOP FREE, BOTTOM AND VERTICAL EDGES FIXED

(*Clauses* 2.1, 2.1.1, 2.2 *and* 2.2.2)

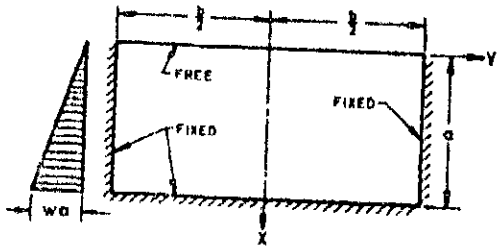
a = height of the wall

b = width of the wall

w = density of the liquid

Horizontal moment = $M_x\, wa^3$

Vertical moment = $M_y\, wa^3$



b/a	x/a	$y = 0$		$y = b/4$		$y = b/2$	
		M_x	M_y	M_x	M_y	M_x	M_y
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
3·00	0	0	+0·025	0	+0·014	0	−0·082
	1/4	+0·010	+0·019	+0·007	+0·013	−0·014	−0·071
	1/2	+0·005	+0·010	+0·008	+0·010	−0·011	−0·035
	3/4	−0·033	−0·004	−0·018	−0·000	−0·006	−0·028
	1	−0·126	−0·025	−0·092	−0·018	0	0
2·50	0	0	+0·027	0	+0·013	0	−0·074
	1/4	+0·012	+0·022	+0·007	+0·013	−0·013	−0·066
	1/2	+0·011	+0·014	+0·008	+0·010	−0·011	−0·053
	3/4	−0·021	−0·001	−0·010	−0·001	−0·005	−0·027
	1	−0·108	−0·022	−0·077	−0·015	0	0
2·00	0	0	+0·027	0	+0·009	0	−0·060
	1/4	+0·013	+0·023	+0·007	+0·010	−0·012	−0·059
	1/2	+0·015	+0·016	+0·010	+0·010	−0·100	−0·049
	3/4	−0·008	+0·003	−0·002	+0·003	−0·005	−0·027
	1	−0·086	−0·017	−0·059	−0·012	0	0

(*Continued*)

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Re ~~End Semester~~ Examination

~~December 2024~~ Jan 2025 14/1/25

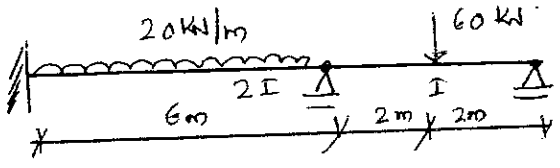
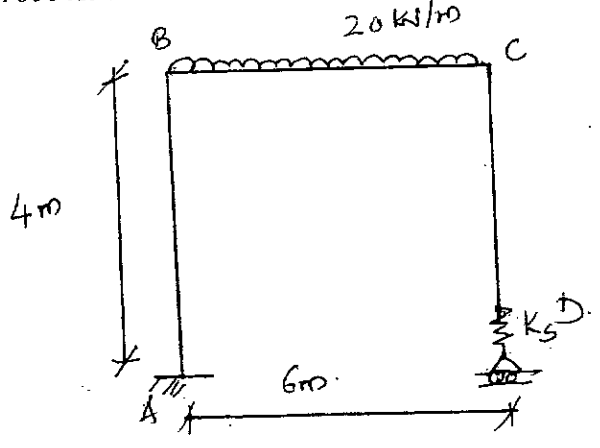
Max. Marks: 100 Duration: 3Hours

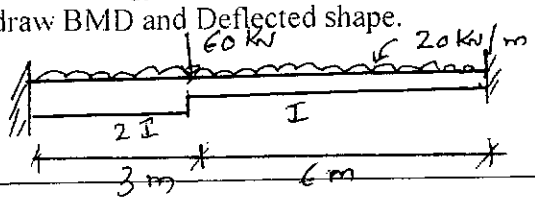
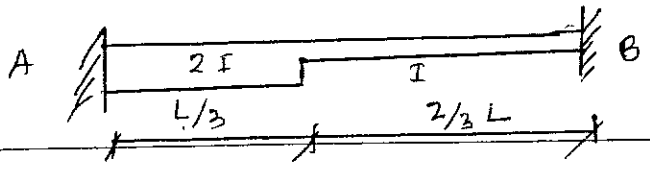
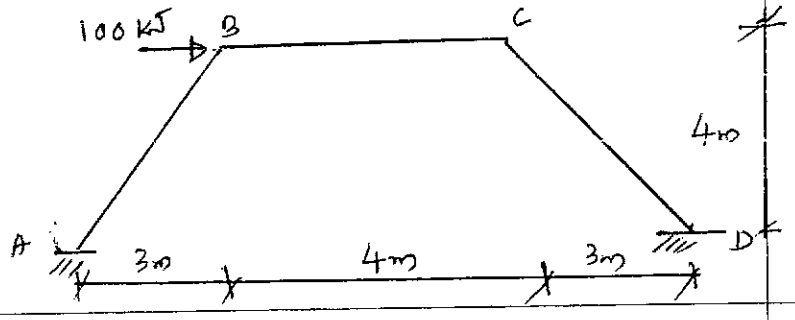
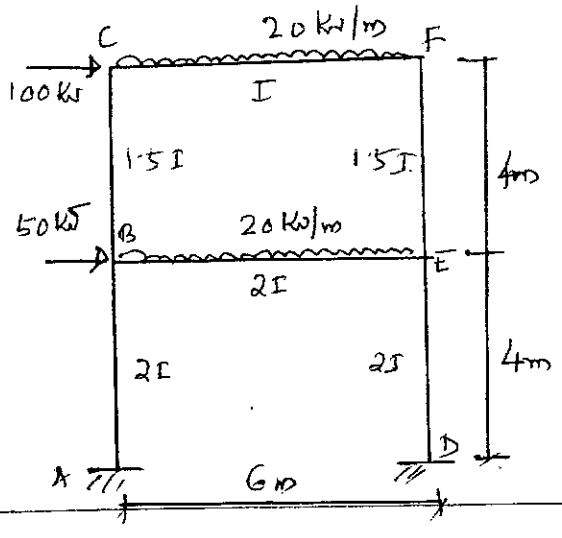
Class: B.Tech. Civil Sem VII Semester: VII Program: Civil Engineering

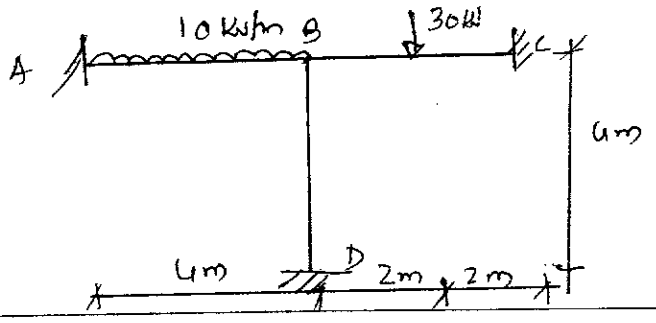
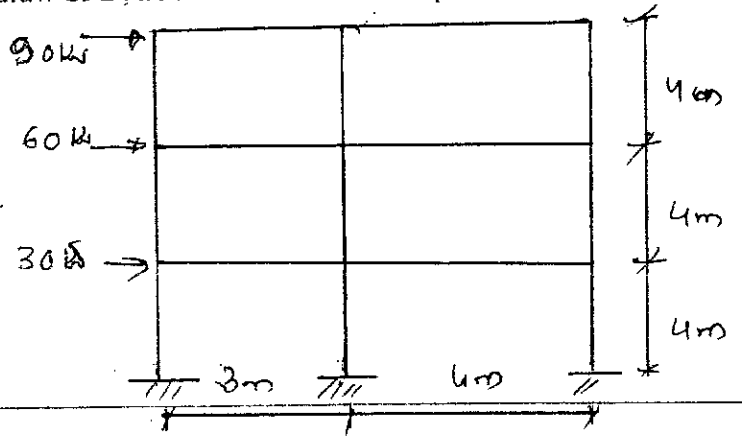
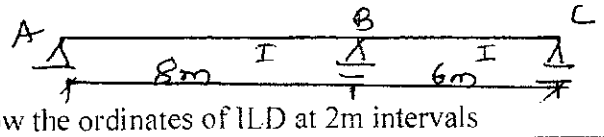
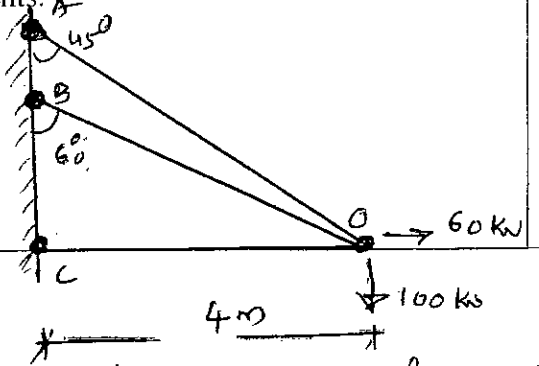
Name of the Course: Advanced Structural Analysis Course Code : PEC- BTC721

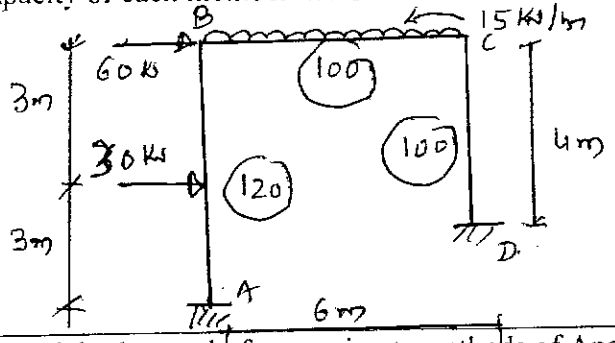
Instructions:

- Answer to any five questions
- Answers to all sub questions should be grouped together.
- Figures to the right indicate full marks.
- Assume suitable data if necessary and state the same clearly.

Question No		Max. Marks	Course outcome	Module No.
Q1 (a)	Analyse the beam shown in figure by Matrix Stiffness method and draw BMD & deflected shape. 	10	1,6	2
Q1 (b)	Analyse the rigid jointed frame shown in Figure by flexibility method and draw BMD and deflected shape. Note that D supported on elastic foundation, which is free to move horizontally and also free to rotate. EI = 2 X 10^4 KN-m^2 and K_s = 1000 KN/m. 	10	2	4

Q 2 (a)	Using Column Analogy Method, analyse the beam shown in figure and draw BMD and Deflected shape. 	10	2	4
Q2 (b)	For the non-prismatic beam element shown in figure calculate the rotational stiffness at A and COF from A to B. 	10	2	4
Q 3(a)	Derive the modified stiffness and carry over factor for a symmetric beam (axis of symmetry passing through center of beam) subjected to (i) symmetric loads (ii) Anti symmetric loads	4	1	3
Q3 (b)	Analyse the frame shown in figure by Elastic Centre Method and draw BMD and deflected shape. 	16	2	4
Q4	Analyse the frame shown in figure by Modified Moment Distribution Method and draw SFD, BMD & deflected shape 	20	1	3

Q5(a)	Analyse rigid jointed plane frame shown in figure by Matrix Stiffness Method and draw BMD and deflected shape. 	8	1,6	2
Q5(b)	Analyse the frame shown in figure by cantilever Method and draw SFD, BMD and deflected shape. 	12	3	6
Q6(a)	(ii) State Muller Breslau's Principle	1	5	5
Q6(b)	For the beam shown in figure, construct the ILD for: (i) Reaction at 'C' R_C (ii) Bending Moment at B 'M_B'  Show the ordinates of ILD at 2m intervals	10	4	5
Q6(c)	Analyse pin jointed plane frame shown in figure by Matrix Stiffness Method and calculate the member forces and member displacements.  C/S area of all members = 1000 mm² E = 2×10⁵ N/mm²	9	1, 6	2

Q7(a)	Using plastic analysis, determine the load factor for the frame loaded as shown in figure. The Plastic Moment capacity of each member in KN-m is indicated in the figure.  	16	5	7
Q7(b)	i) Explain the need of approximate methods of Analysis (ii) Is Elastic centre method is flexibility method or stiffness method? Justify your answer.	2 2	3 2	6 4

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~~END SEMESTER EXAMINATION~~ RE EXAMINATION,

~~DECEMBER - 2024~~ JANUARY 2025

14/1/25

Program: Civil Engineering B.Tech Civil Sem VII **Duration: 3 Hr.**

Course Code: PE – BTC – 761 **Maximum Points: 100**

Course Name: Pavement Design and Construction **Semester: VII**

Note :

(i) **Question 1 is compulsory**

(ii) **Solve any four questions out of remaining six questions**

(iii) **Assume suitable data if required**

Q.No.	Questions	Points	Modul	BL	CO
Q 1.	Write short notes on (Solve any four, each carries five marks)	20			
a	Equivalent single wheel load		01	02	01
b	construction of roller compacted concrete pavement		03	02	03
c	Construction of surface dressing		04	01	04
d	Burmister two layer and three layer theory.		02	02	02
e	Different joints in rigid pavement		03	01	03
Q.2.					
a	Discuss the field procedure for conducting plate bearing test. How will you calculate the modulus of subgrade reaction	08	02	02	03
b	The plate bearing test were conducted using 30 cm diameter plate on subgrade soil and over a base course of thickness 30 cm. the pressure yield at 0.5 cm deflection on subgrade and base course were 1.2 kg/cm^2 and 2.5 kg/cm^2 respectively. Design the thickness of base course required for a wheel load of 5100 kg with a tyre pressure of 5.5 kg/cm^2 for an allowable deflection of 0.5 cm using Burmister two layers theory. If 7.5 cm thick bituminous concrete layer having modulus of elasticity 2500 kg/cm^2 to be provided at the top of base, calculate the equivalent thickness of base to be replace, also design three layers system	12	02	03	02

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~~DECEMBER - 2024~~ JAN 2025

Q.3.					
a	What is Rigid Pavements? State the advantages and disadvantages of rigid pavements over flexible pavements.	08	02 & 03	01	02
b	Determine the wheel load stress using modified Westergard Equation, warping stress at edge and corner region of 25 cm thick rigid pavement slab due to daily variation of temperature . frictional stress due to seasonal variation of temperature and combine stress. Assume following data (i) The transverse joint is at 4.5 m interval and longitudinal joint is at 3.5 m distance. (ii) Maximum difference of temperature during day to be 0.6^0 C per cm thickness of the slab. (iii) Modulus of elasticity of concrete = $3.1 * 10^5$ kg/cm^2, Poisson's ration = 0.15. Coefficient of thermal expansion = $10* 10^{-5}$ per ^{0} C.. Modulus of subgrade reaction, k = 8 kg/cm^3, Radius of loaded area = 15 cm,	12	03	03	02
Q.4.					
a	Define rutting failure criteria. State the rutting equation for calculation of design life of the Pavement	06	02	02	02
b	Discuss the steps for design of cement concrete low volume rural roads.	06	03	02	02
c	Design the tie bar in longitudinal joint of cement concrete pavement having thickness 25 cm and width 3.5 m using the following Density of concrete = 2400 kg/cm^3, Allowable working stress in deformed steel bar = 2000 kg/cm^2, Permissible bond stress in concrete = 24 kg/cm^2, Coefficient of friction = 1.2	08	03	03	02
Q.5.					
a	Discuss with sketch why surface drainage system required in highways. How will you estimate the design discharge.	08	06	02	02

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~~DECEMBER – 2024~~ JAN 2025

	The surface water from the road side is drained to longitudinal side drain. From across the half of bituminous surface of total width 7.0 m, the shoulder and adjoining land on one side of drain is 10 m and on other side of longitudinal drain the water flow across from reserved land with grass and 2 % cross slope to words side drain. The width of strip of reserved land is 30 m. The runoff coefficient for pavement, shoulder and reserved land with gross cover is 0.80, 0.30 and 0.38 respectively. The length of stretch of land parallel to road from where water is expected to flow to the side drain is 500 m. Estimate the quantity of runoff flowing through longitudinal drain. Also design the longitudinal rectangular drain. Take n = 0.022, v = 0.90 m/sec. (1) Period of frequency = 25 years				
b		12	06	04	03
Q.6.					
a	Discuss the field procedure for conducting Benkelman Beam study.	10	05	02	02
	The Benkelman Beam Study were carried out on a poor stretch of road. The 15 sets of observations were taken for the stretch of road. If the rebound deflection for each set of observation are:				

1.46	1.52	1.56	1.76	1.96
1.74	1.68	1.74	1.96	1.42
1.56	1.62	1.68	1.90	1.92

	Also, The traffic volume study were carried out and on last count it is found to be 1000 cvpd and three years required for overlay construction after last count. The temperature is observed at 1 hr interval during the study and average temperature found to be 38^{0}C. Design the overlay thickness of (i) Bitumenous Macadam, (ii) Bitumenous Concrete and (iii) WBM type overlay as per IRC 81:1997. (assume LDF = 0.75, VDF = 1.5, subgrade moisture correction factor = 1.3, 84 % deflection in overlay design)				
b		10	05	03	03
Q.7.					

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~~DECEMBER - 2024~~ JAN 2025

a	How will you repair following types of distresses observed on surface of flexible pavement (i) Pot holes (ii) longitudinal cracks	10			
b	How will you decide the optimum quantity of lime required for stabilization of subgrade? Also, discuss the steps for construction of lime stabilized subgrade.	10	04	03	03

Q. 2. (b).

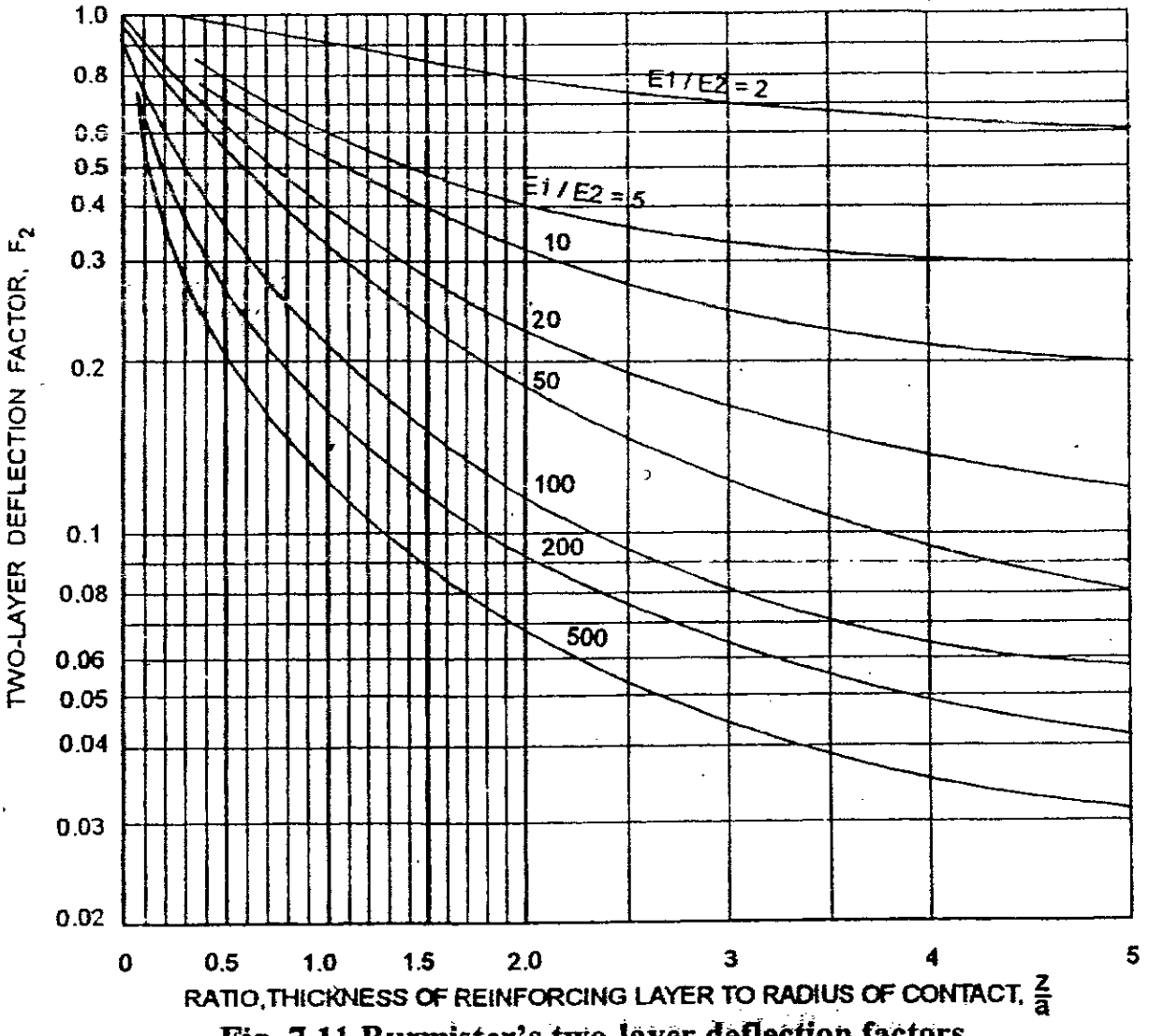

Fig. 7.11 Burmister's two-layer deflection factors

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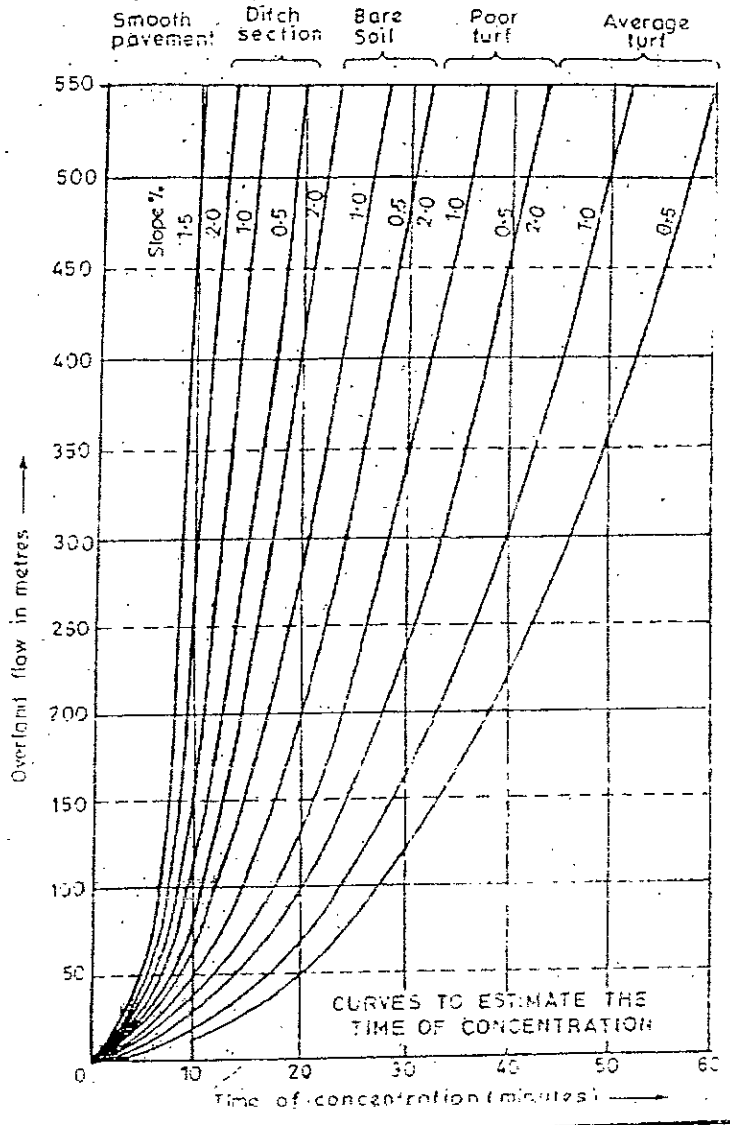
Q.5 (b).



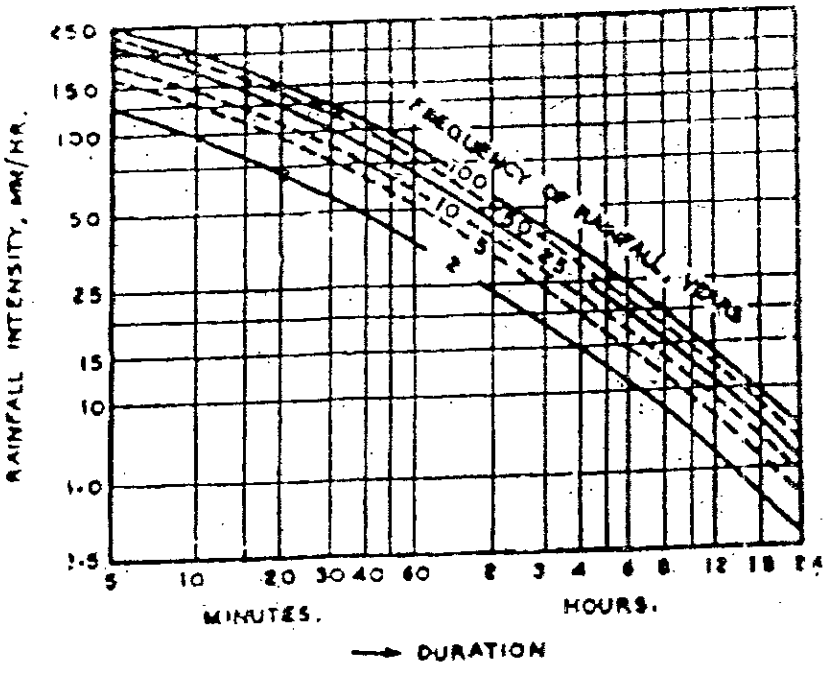
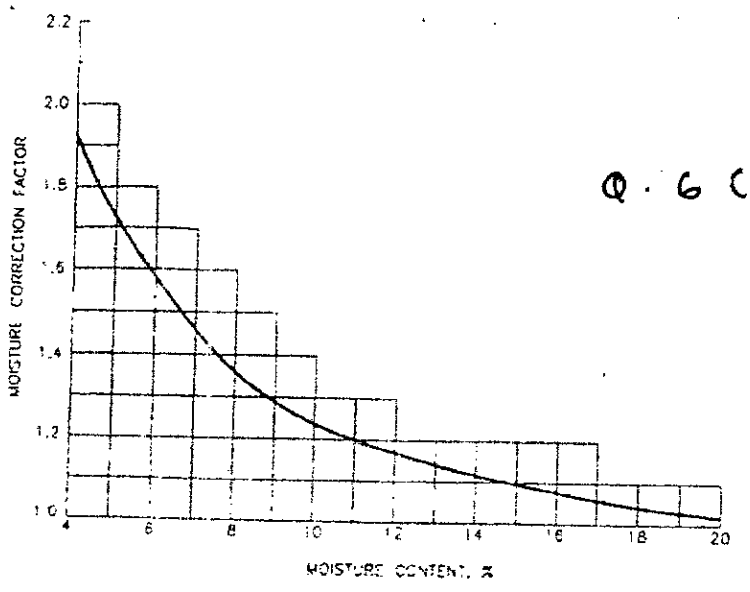


Fig. 11.4 Typical Rainfall Intensity Duration Curve



Q. 6 (b).

Moisture correction factor for clayey subgrade with high plasticity (PI > 15) for low rainfall areas (Annual rainfall ≤ 1300 mm)

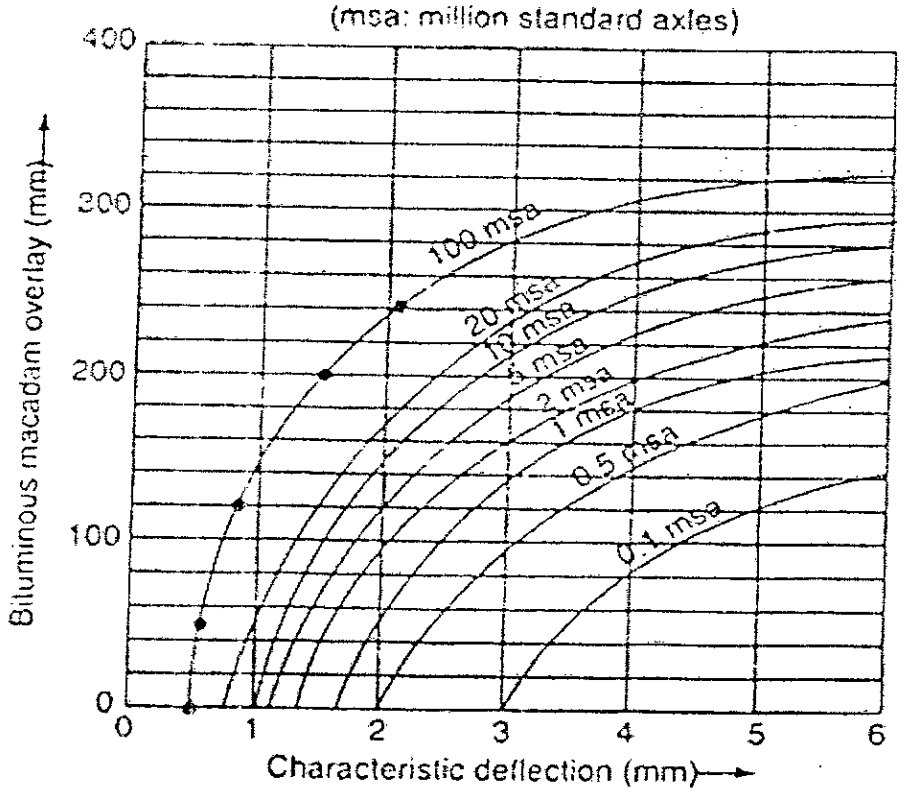


FIG 10.10 *Overlay thickness design curves (IRC: 81–1997)*

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~~END SEM~~/RE-EXAM EXAMINATION ~~DEC~~/JAN 2024-25

Program: B.Tech Civil Engineering Sem VII

Duration: 3 hours

Course Code: PE-BTC726

Maximum Points:100

Course Name: Prestressed concrete

Semester:VII

Notes : ***Attempt any 5 main questions out of 7; Assume any missing data and state the same clearly; Illustrate your answers with neat sketches, Use of IS 1343 is allowed***

Q.No.	Questions	Points	CO	BL	M
1.a)	A cantilever prestressed I girder has flange dimensions as 700x350mm and web dimensions as 300x700mm and the span is 5m. It is prestressed using a cable with parabolic profile, such that effective prestressing force is 1900kN. The cable is concentric at free end and has an eccentricity of 200mm at support. The girder supports a live load UDL of 10kN/m. Calculate the total stresses induced in the girder at midspan and supports.	10	1	3	
1.b)	Explain external and internal prestressing with suitable examples and applications.	05	1	1,2	
1.c)	Explain the need of high strength materials in prestressed concrete structures	05	1	1,2	
2.a)	Calculate the flexural capacity of a pretensioned I girder having the following properties: Flange = 800x250mm Web = 300x2000mm Area of cables = 1200mm^2 fpu = 1650MPa Effective depth = 2000mm fck = 45MPa	06	3,5	3	
2.b)	Explain the steps in strain compatibility method for evaluating flexure capacity of prestressed sections.	04	3	2	
2.b)	Design the shear reinforcement ***at quarter span*** for a simply supported beam of rectangular cross section 350mmx800mm and span 14m. It carries a live load UDL of 10kN/m(unfactored). It is prestressed by a straight cable that is having eccentricity of 300mm ; fck = 45MPa Effective prestress in cable = 1000MPa Characteristic strength of PT steel = 1600MPa Use Fe500 grade steel for reinforcement.	10	3,5	4	

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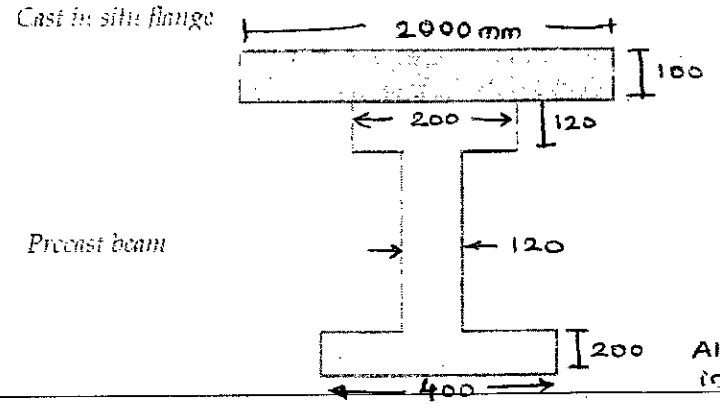
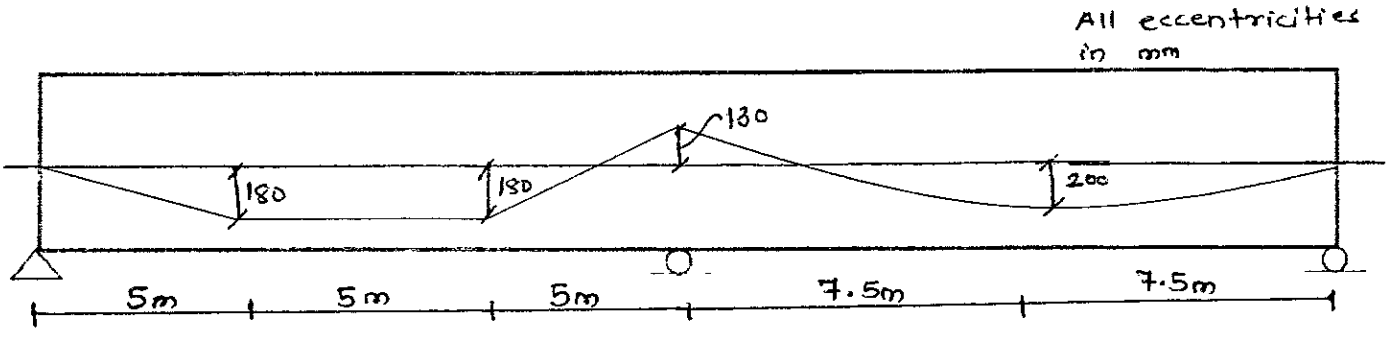
3.a)	A simply supported post tensioned beam of span 20m with 2 cables having a cross section of 300mm X 1200mm is successively tensioned from a single end in the order of cables1-2. Each cable has a cross section area of 300mm^2 and an initial tension of 1250MPa and M45 is used for the beam. Co-efficient for friction = 0.5; co-efficient for wave effect = 0.0014/m. Age of concrete at transfer of prestress = 28days. Anchorage slip = 2.5mm. Es = 210kN/mm^2, Calculate the % losses due to elastic shortening, shrinkage (at 100days), friction and anchorage slip.	15	2,5	3	

	Profile	Eccentricity at midspan	Eccentricity at support
Cable 1	Parabolic	200mm (below CG)	50mm (below CG)
Cable 2	Straight	450mm (below CG)	450mm (below CG)

3.b)	Explain the effect of prestressing on shear resistance of sections using principal stresses and Mohr's circle concept.	5	1,3	2	
4.	Design a Type 1 post tensioned bonded girder (simply supported) for the following data : Effective span = 18m; Live load = 20kN/m; fck = 45MPa; fci = 30MPa; Es = 210kN/mm^2 Assumed loss % = 35% Use 8mmϕ strands for cables. The characteristic strength of cables is 1600MPa. Calculate the size of section required, prestressing force, eccentricity with safe cable zone. Draw neat sketch of the cable profile	20	3,5	4	
5.a)	The prestressed concrete beam as shown in figure below consists of a precast beam and cast in situ slab. If the differential shrinkage is 1.5×10^{-4} find the shrinkage stresses at extreme fibres of slab and beam and sketch its variation across the depth. Use M40 grade of concrete. 	12	4	3	

~~END SEM~~/RE-EXAM EXAMINATION ~~DEC~~/JAN 2024-25

5.b)	Explain the terms propped and unpropped sections in context of composite construction. State the relative merits and demerits of these methods.	08	4	2	
6.a)	i) Derive the value of deflection for a simply supported beam prestressed with parabolic cable –concentric at supports and having eccentricity "e" at midspan. ii) A simply supported prestressed beam of cross section 350mmX800mm and span 12m has a straight profile of cable with eccentricity of 200mm below CG and a parabolic profile concentric at supports and having e=150mm at mid span. It carries a live load of 10kN/m. The area of each cable is 500mm^2 and it is initially tensioned to 1450N/mm^2. % losses = 30% Calculate the : i) Instantaneous deflection due to dead load + prestressing force ii) Long term deflection if the creep coefficient is 1.6 Es=210kN/mm^2; Ec =35kN/mm^2	10	1	3	
6.b)	The end block of a post-tensioned beam has two anchorages with 300x300 mm - square bearing plates located at 350mm from top and bottom respectively. The size of end block is 700x1400mm. An initial pre-stressing force of 800 kN is applied to each anchorage. Design the end zone reinforcement.	10	3,5	3,5	
7.a)	The cable profile for a two span continuous beam is as shown in figure below. The prestressing force is 1250kN. Locate the pressure line due to prestressing force and a UDL of 25kN/m on full span	20	4	4	



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Program: BTECH (MECH.ENGG.) / CSVM **Duration:** 3 hrs.

Course Code: OE-BTM717 **Maximum Points:** 100

Course Name: Digital Twin

Semester: VII

16/11/25

- Solve any 5 questions out of seven
- Figures to the right indicate full marks
- Draw neat sketches & figures wherever required

Q.No.	Questions	Points	CO	BL	PI
Q.1 (a)	(1) Define the role of sensors in Industry 4.0. How do advancements in sensor technology enable real-time decision-making in smart factories? (2) Describe how computing power and connectivity contribute to the implementation of Industry 4.0 in manufacturing.	[05] [05]	1,2,3	2	3.2.1
(b)	(1) Compare Product Digital Twin and Process Digital Twin. Discuss their roles in improving manufacturing efficiency. (2) Discuss the potential applications of Partial Digital Twins in scenarios where complete digital twin implementation is not feasible. Provide examples & Figures	[05] [05]	1,2,3	2	3.2.1
Q.2 (a)	Explain how predictive maintenance can enhance decision-making in Smart Factories. What role do Digital Twins play in implementing predictive maintenance strategies? Explain with neat sketches. Also explain the predictive maintenance/analytics algorithm pipeline	[10]	1,2,3	2	5.4.1
(b)	Explain how the integration of Digital Twin with PLM can create a feedback loop that improves product design and lifecycle management.	[10]	1,2	2	5.4.1
Q.3 (a)	*A* Smart City uses Digital Twins for traffic management. Explain how Big Data Analytics and Machine Learning can predict and prevent traffic jams. Illustrate your answer with a figure showing data sources,	[20]	2,3	3	5.5.1

	analytics, and feedback loops.				
Q.4 (a)	Propose an architecture for a smart factory that integrates IIoT platforms with Digital Twins. How can this architecture enhance production efficiency and reduce downtime?	[10]	2,3	3	5.5.1
(b)	Explain BIM with neat sketch? Also explain advantages of BIM & Machine Learning integration	[10]	1,2,3	2	5.5.1
Q.5 (a)	A city plans to implement a digital twin for its transportation system. What data sources are required, and how can IIoT platforms support real-time monitoring and predictive analytics?	[10]	3,4	3	5.5.1
(b)	Digital Twin technology is transforming industries by enabling new business and revenue models in Smart Cities, Smart Manufacturing, and Smart Factories. Discuss how Digital Twins can be leveraged to create innovative business models in these domains.	[10]	2,3	3	5.1.2
Q.6	(1) How can integrating Digital Twins with Blockchain and AI revolutionize the PLM ecosystem? Propose a conceptual framework. Explain the integration of all of them in detail along with its benefits (2) Discuss the role of Digital Twins in improving the efficiency of Enterprise Resource Planning (ERP) systems. Provide examples of real-time data utilization with proper figures	[10] [10]	3,4	3	5.5.1
Q.7	Write Short notes on (any three)	[20]	2,3,4	3	5.4.1, 5.5.1
	• DT in Warehouse Management Systems (WMS) • DT in Smart Containers • DT in Product Development • DT in Logistics • DT in Construction Industry • Digital twin driven power transformer • DT in Asset Maintenance				

********** All the Best **********