



Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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



END SEM/RE-EXAM EXAMINATION MAY / JUNE 2025

Program: ELECTRICAL

Course Code: BS-BTE401

Course Name: Transforms Statistics & Probability

Duration: 03 Hours

Maximum Points: 100

Semester: IV

- Attempt any five out of seven questions
- Use of scientific calculator is allowed.

13/5/25

Q N O	QUESTION	POI NT S	C O	B L	Mc ule no																				
Q 1a)	The experiment is repeated 128 times and following distribution is obtained. <table><tr><td>No.of heads</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>Total</td></tr><tr><td>Freque ncy</td><td>7</td><td>6</td><td>19</td><td>35</td><td>30</td><td>23</td><td>7</td><td>1</td><td>128</td></tr></table> Fit a Binomial distribution if the nature of coins is unknown.	No.of heads	0	1	2	3	4	5	6	7	Total	Freque ncy	7	6	19	35	30	23	7	1	128	06	4	2	4
No.of heads	0	1	2	3	4	5	6	7	Total																
Freque ncy	7	6	19	35	30	23	7	1	128																
Q 1 b)	Two cards are drawn simultaneously from a well – shuffled deck of 52 cards. Compute the variance for the number of aces	06	4	2	4																				
Q 1c)	Find the Fourier Transform of $f(x)$, if $f(x) = \begin{cases} e^{i\omega x}, & a < x < b \\ 0, & x < a, x > b \end{cases}$	08	2		2																				
Q 2 a)	If $z = ax + by$ and 'r' is the correlation between x and y show that $\sigma_z^2 = a^2\sigma_x^2 + b^2\sigma_y^2 + 2abr\sigma_x\sigma_y$ Further show that $r = \frac{\sigma_x^2 + \sigma_y^2 - \sigma_{x-y}^2}{2\sigma_x\sigma_y}$ Where σ_x, σ_y and σ_{x-y} are the standard deviation of x, y and x – y respectively	06	2	2	3																				
Q 2 b)	1000 students are graded according to their I.Q. & their economic conditions. Use chi-square test to find out whether there is any association between economic conditions and the level of I.Q.	06	3	2	7																				

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[illegible]



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Q 5 a)	In an examination it is laid down that a student passes if he secures 30% or more marks. He is placed in Ist, IInd or IIIrd division according as he secures 60% or more marks, between 45% & 60% and between 30% & 45% respectively. He gets distinction in case he secures 80% or more marks. It is noticed from the result that 10% of the students failed in the examination where as 5% of them obtained distinction. Calculate the percentage of students placed in the second division.	06	4	2	5
Q 5 b)	Find the Fourier Series for function $f(x)$ defined by $f(x) = \begin{cases} 0 & -5 < x < 0 \\ 3 & 0 < x < 5 \end{cases}$	06	1		1
Q 5c)	In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible: Variance of $X = 9$ Regression equations: $8x - 10y + 66 = 0$ $40x - 18y = 214$ What are i. Mean, value of x and y ii. Standard deviation of y . iii. Coefficient of correlation between x and y	08	2		7
Q 6 a)	The heights of six randomly chosen sailors are in inches; 63, 65, 68, 69, 71 & 72. The heights of ten randomly chosen soldiers are; 61.62, 65, 66, 69, 69, 70, 71, 72 & 73. Discuss in the light of this data that the soldiers on an average are taller than sailors	06	3	3	6
Q 6)	In a precision bombing attack there is a 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give atleast 99% chance of destroying the target?	06	4	3	5
Q 6c)	Obtain the half range sine series $f(x) = x(\pi - x) \quad 0 < x < \pi$ Hence show that $\sum_{n=1}^{\infty} \frac{1}{n^6} = \frac{\pi^6}{945}$	08	1		1
Q 7a)	Prices of shares of a company on different days in a month were found to be 66, 65, 69, 70, 69, 71, 70, 63, 64 and 68. Discuss whether the price of shares to be 65.	06	3	3	6



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Q 7 b)	Compute spearman's rank coorelation coefficient for the following data	06	2	2	7														
	<table><tr><td>X</td><td>10</td><td>12</td><td>18</td><td>18</td><td>15</td><td>40</td></tr><tr><td>Y</td><td>12</td><td>18</td><td>25</td><td>25</td><td>50</td><td>25</td></tr></table>	X	10	12	18	18	15	40	Y	12	18	25	25	50	25				
X	10	12	18	18	15	40													
Y	12	18	25	25	50	25													
Q 7c)	Obtain the Fourier Series for $f(x) = \begin{cases} 0 & -2 \leq x \leq -1 \\ 1+x & -1 \leq x \leq 0 \\ 1-x & 0 \leq x \leq 1 \\ 0 & 1 \leq x \leq 2 \end{cases}$	08	1		1														

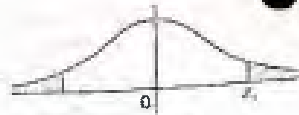
Area Under Standard Normal Curve



This table gives the area under the standard normal curve to the left of the z-value. The area is given to four decimal places. The z-value is given to two decimal places.

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	.7122	.7156	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7421	.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	.8868	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9114	.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	.9736	.9741	.9746	.9750	.9755	.9759
2.0	.9773	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9843	.9846	.9851	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9908	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9933	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9958	.9959	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9975	.9976	.9977	.9978	.9979	.9980	.9981	.9982	.9983	.9984
2.9	.9985	.9986	.9987	.9988	.9989	.9990	.9991	.9992	.9993	.9994
3.0	.9995	.9996	.9997	.9998	.9999	.9999	.9999	.9999	.9999	.9999

Percentage Points of t - distribution



Example
For $\Phi = 10$ d. o. f.
 $P(|t| > 1.812) = 0.1$

Φ	P	0.20	0.10	0.05	0.02	0.01
1		3.078	6.314	12.706	31.812	63.657
2		1.886	2.920	4.503	9.905	19.000
3		1.638	2.353	3.182	4.541	5.841
4		1.533	2.132	2.776	3.747	4.604
5		1.476	2.015	2.571	3.365	4.032
6		1.440	1.943	2.447	3.143	3.707
7		1.415	1.895	2.365	2.998	3.499
8		1.397	1.860	2.306	2.896	3.355
9		1.383	1.833	2.262	2.821	3.250
10		1.372	1.812	2.228	2.764	3.169
11		1.363	1.796	2.201	2.718	3.103
12		1.356	1.782	2.179	2.681	3.055
13		1.350	1.771	2.160	2.650	3.012
14		1.345	1.761	2.145	2.624	2.977
15		1.341	1.753	2.131	2.602	2.947
16		1.337	1.746	2.120	2.583	2.921
17		1.333	1.740	2.110	2.567	2.898
18		1.330	1.734	2.101	2.552	2.878
19		1.328	1.729	2.093	2.539	2.861
20		1.325	1.725	2.086	2.528	2.845
21		1.323	1.721	2.080	2.518	2.831
22		1.321	1.717	2.074	2.508	2.819
23		1.319	1.714	2.069	2.500	2.807
24		1.318	1.711	2.064	2.492	2.797
25		1.316	1.708	2.060	2.485	2.787
26		1.315	1.706	2.056	2.479	2.779
27		1.314	1.703	2.052	2.473	2.771
28		1.313	1.701	2.048	2.467	2.763
29		1.311	1.699	2.045	2.462	2.755
30		1.310	1.697	2.042	2.457	2.750
40		1.303	1.684	2.021	2.423	2.701
60		1.285	1.671	2.000	2.390	2.660
120		1.269	1.658	1.980	2.358	2.617
∞		1.262	1.645	1.960	2.325	2.576

Percentage Points of χ^2 - distribution



Example
For $\Phi = 10$ d. o. f.
 $P(\chi^2 > 15.99) = 0.10$

P	0.99	0.95	0.50	0.10	0.05	0.02	0.01
1	0.000157	0.00393	0.455	2.706	3.841	5.214	6.635
2	0.0201	0.103	1.386	4.605	5.991	7.824	9.210
3	0.115	0.352	2.366	6.251	7.815	9.837	11.341
4	0.297	0.711	3.357	7.779	9.488	11.668	13.277
5	0.554	1.145	4.351	9.236	11.070	13.388	15.086
6	0.872	1.635	5.348	10.645	12.592	15.033	16.812
7	1.339	2.167	6.346	12.017	14.067	16.622	18.475
8	1.646	2.733	7.344	13.362	15.507	18.168	20.090
9	2.088	3.325	8.343	14.684	16.919	19.679	21.666
10	2.558	3.940	9.340	15.987	18.307	21.161	23.209
11	3.053	4.575	10.341	17.275	19.675	22.618	24.725
12	3.571	5.226	11.340	18.549	21.026	24.054	26.217
13	4.107	5.892	12.340	19.812	22.362	25.472	27.688
14	4.660	6.571	13.339	21.064	23.685	26.873	29.141
15	4.229	7.261	14.339	22.307	24.996	28.259	30.578
16	5.812	7.962	15.338	23.542	26.296	29.633	32.000
17	6.408	8.672	16.338	24.769	27.587	30.995	33.409
18	7.015	9.390	17.338	25.989	28.869	32.346	34.805
19	7.633	10.117	18.338	27.204	30.144	33.687	36.191
20	8.260	10.851	19.337	28.412	31.410	35.020	37.566
21	8.897	11.591	20.337	29.615	32.671	36.349	38.932
22	9.542	12.338	21.337	30.813	33.924	37.659	40.289
23	10.196	13.091	22.337	32.007	35.172	38.968	41.638
24	10.856	13.848	23.337	32.196	36.415	40.270	42.980
25	11.524	14.611	24.337	33.382	37.652	41.566	44.314
26	12.198	15.379	25.336	34.641	38.885	42.796	45.642
27	12.879	16.151	26.336	35.774	40.113	44.140	46.963
28	13.565	16.928	27.336	36.916	41.337	45.419	48.278
29	14.256	17.708	28.336	38.087	42.557	46.693	49.588
30	14.953	18.493	29.336	39.256	43.773	47.962	50.892

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

	On the basis of this data, can it be concluded that the drug and sugar pills differ significantly in curing cold?				
Q2c)	Find the Fourier Transform of $f(x)$, if $f(x) = \begin{cases} e^{iox}, & a < x < b \\ 0, & x < a, x > b \end{cases}$	08	2		2
Q3a	Show that the correlation coefficient r lies between -1 and 1.	06	4	2	3
Q3 b)	In an examination marks obtained by students in mathematics, physics and chemistry are normally distributed with means 51, 53 and 46 with standard deviations 15, 12, 16 respectively. Find the probability of securing total marks (i) 180 or more (ii) 90 or below	06	4	4 5	5
Q3c)	Find the Fourier series for $f(x) = \begin{cases} 0 & -\pi \leq x \leq 0 \\ x & 0 \leq x \leq \pi \end{cases}$	08	1	4	1
Q4 a)	The length of time a lady speaks on telephone is found to be a random variable with PDF $f(x) = \begin{cases} Ae^{-x/5}, & x \geq 0 \\ 0, & x < 0 \end{cases}$. Find A and the probability that she will speak for (i) more than 10 minutes (ii) less than 5 minutes (iii) between 5 & 10 minutes.	06	4	3	5
Q4 b)	Obtain complex form of the Fourier series for $f(x) = e^{-x}$ $0 \leq x \leq 2\pi$	06	1	2	2
Q4c)	Of the three men, the chances that a politician, a businessman and an academician will be appointed as a vice chancellor of a university are 0.50, 0.30 & 0.20 respectively. Probability that research is promoted by these people if they are appointed as vice chancellor are 0.3, 0.7 & 0.8 respectively. Determine the probability that research is promoted in the university. Also find if research is promoted in the university what is the probability that the VC is an academician.	08	4		4
Q5 a)	In an examination it is laid down that a student passes if he secures 30% or more marks. He is placed in Ist, IInd or IIIrd division according as he secures 60% or more marks, between 45% & 60% and between 30% & 45% respectively. He gets distinction in case he secures 80% or more marks. It is noticed from the result that 10% of the students failed in the examination where as 5% of them obtained distinction. Calculate the percentage of students placed in the second division.	06	4	2	5

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

Q5 b)	Find the Fourier Series for function $f(x)$ defined by $f(x) = \begin{cases} \pi x & 0 \leq x \leq 1 \\ \pi(2-x) & 1 \leq x \leq 2 \end{cases}$	06	1	2	1																																	
Q5c)	In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible: Variance of $X = 9$ Regression equations: $8x - 10y + 66 = 0$ $40x - 18y = 214$ What are i. Mean, value of x and y ii. Standard deviation of y . iii. Coefficient of correlation between x and y	08	2	3	7																																	
Q6a)	Samples of two types of bulbs were tested for length of life and following data were obtained. <table border="1"><thead><tr><th></th><th>Size</th><th>Mean</th><th>S.D.</th></tr></thead><tbody><tr><td>Sample I</td><td>8</td><td>1234 hours</td><td>36 hours</td></tr><tr><td>Sample II</td><td>7</td><td>1036 hours</td><td>40 hours</td></tr></tbody></table> Is the difference in the means sufficient to warrant that type I bulbs are superior to type II bulbs?		Size	Mean	S.D.	Sample I	8	1234 hours	36 hours	Sample II	7	1036 hours	40 hours	06	3	4	6																					
	Size	Mean	S.D.																																			
Sample I	8	1234 hours	36 hours																																			
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Q6b)	In a precision bombing attack there is a 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give atleast 99% chance of destroying the target?	06	4	3	5																																	
Q6c)	Obtain the Fourier Series for $f(x) = \sin x \quad -\pi \leq x \leq \pi$	08	1		1																																	
Q7a)	For a random sample of 10 pigs fed diet A, the increases in weight in pounds in a certain period were 10, 6, 16, 17, 13, 12, 8, 14, 15, 9. For another random sample of 12 pigs, fed on diet B, the Increase in the same period were 7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17. Test whether the diets A & B differ significantly as regards their effect on Increase in weight.	06	3	3	6																																	
Q7 b)	Ten contestants in a beauty contest are judged by three judges in the following order. <table border="1"><thead><tr><th></th><th>6</th><th>10</th><th>2</th><th>9</th><th>8</th><th>1</th><th>5</th><th>3</th><th>4</th><th>7</th></tr></thead><tbody><tr><td>Ranks by 1st judge</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2nd Judge</td><td>5</td><td>4</td><td>10</td><td>1</td><td>9</td><td>3</td><td>8</td><td>7</td><td>2</td><td>6</td></tr></tbody></table>		6	10	2	9	8	1	5	3	4	7	Ranks by 1st judge											2nd Judge	5	4	10	1	9	3	8	7	2	6	06	2	2	7
	6	10	2	9	8	1	5	3	4	7																												
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2nd Judge	5	4	10	1	9	3	8	7	2	6																												



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	Illrd judge	4	8	2	10	7	5	9	1	3	6				
	Using rank coorelation coeeficient find which pair of judges has the nearest approach to common tastes in beauty														
Q7c)	If $f(x) = x$ $0 \leq x \leq 2$ Find half range cosine series using Parseval's identity deduce $\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \dots$											08	1		1



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END SEMESTER EXAMINATION MAY 2025 / Re-Exam June 2025

Program: **B. Tech (Electrical)**

Duration: 3 hr

Course Code: PC-BTE401

Maximum Points: 100

Course Name: Power Generation, Transmission & Distribution

Semester: **IV**

Note: Question 1 is compulsory; attempt any 4 from remaining 6.

15/5/25

Q. No.	Question	Points	CO	BL	Module No.
Q.1a	A three phase 60 Hz, 500-kV AC transmission line is 400 km long. The line inductance is 0.88853 mH/km per phase and its capacitance is 0.01268 micro-Farad/km per phase. The line delivers 2000 MVA at 0.8 lagging power factor at 500 kV. Assume lossless line and determine the sending end quantities and voltage regulation using long line model.	10	2	2,3	4
Q.1b	a) Calculate the receiving end voltage when the line given in Q.1a is terminated in an open circuit and is energized with 500 kV at the sending end. b) Determine the reactance and the MVAR of a three phase shunt reactor to be installed at the receiving end to keep the no load receiving end voltage at the rated value.	6	2	2,3	4
Q.1c	Calculate SIL loading for the transmission line mentioned in Q.1a. Find sending end voltage, current in case load is equal to SIL loading. Draw the vector diagram showing voltage and current at receiving & sending end. Hence comment on voltage profile of line under SIL loading	4	2	3,4,5	4
Q.2	Draw a neat diagram of construction of a 3 core cable with various layers of protection around it. Explain the purpose of each layer and material used for the same.	10	2	1,2	3
Q.2b	What are the objectives of neutral grounding & equipment earthing? [4m] Explain the terms touch voltage & step voltage with neat diagram. [6m]	10	3	1,2	6
Q.3a	A power station has to meet the following demand : Group A : 200 kW between 8 A.M. and 6 P.M. Group B : 100 kW between 6 A.M. and 10 A.M. Group C : 50 kW between 6 A.M. and 10 A.M. Group D : 100 kW between 10 A.M. and 6 P.M. and then between 6 P.M. and 6 A.M. Plot the daily load curve & load duration curve for the power station	10	1	1,2	1



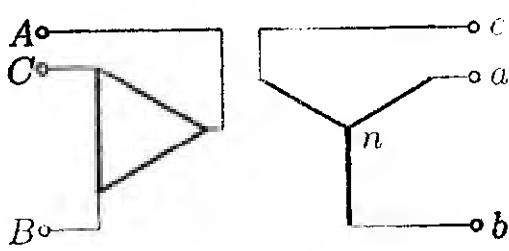
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END SEMESTER EXAMINATION MAY 2025 / Re-Exam June 2025

Q.3b	Draw neatly showing each component of distribution system i.e. feeder, distributor, transformer & service Mains for 1) Radial feeder & 2) Ring main system. (only diagrams) "The Ring main system is more reliable than radial distribution system". Justify.	10	4	1,2,4,5	7
Q.4a	A three-phase transmission line has a per phase series impedance of $z = 0.03 + j0.4 \text{ ohm per km}$ and a per phase shunt admittance of $y = j4 \times 10^{-6} \text{ siemens per km}$. The line is 125 km long. Obtain the ABCD transmission matrix using Pi model. Determine the sending end quantities , and transmission efficiency when the line is receiving 407 MW, 7.833 Mvar at 350 kV.	10	2	2,3	4
Q.4b	Two single-phase ideal voltage sources are connected to two ends a transmission line of impedance of $0.7 + j2.4 \text{ ohm}$ with voltages given as $V_1 = 585 \angle 16.26^\circ \text{V}$ and $V_2 = 500 \angle 0^\circ \text{V}$. Find the complex power for each machine and determine whether they are delivering or receiving real and reactive power. Also, find the real and the reactive power loss in the line.	10	2	2,3,5	1,5
Q.5a	With the help of vector diagram explain the overvoltage phenomena in case a line to ground fault occurs in a 3 phase system with ungrounded neutral. [6m] Suggest the remedy in brief.[4m]	10	3	3,4,5	6
Q.5b	For a 3 phase delta-star transformer as shown below, draw the vector diagram and hence prove that there is a 30° phase shift between line to line voltage angles of primary and secondary winding. 	4	2	2,3	5
Q.5c	The three conductors A, B and C of a 3- phase line are arranged in a horizontal plane with $D_{AB} = 2 \text{ m}$ and $D_{BC} = 2.5 \text{ m}$. Find line-to-neutral capacitance per km if diameter of each conductor is 1.24 cm. The conductors are transposed at regular intervals. Also find charging current per phase if the line is maintained at 66 kV, 50 Hz	6	2	2,3	3
Q. 6a	List out all electrical storage systems. Explain working principle, advantages & limitations of pumped hydro storage and battery storage systems.	10	1	2,3	2



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END SEMESTER EXAMINATION MAY 2025 / ~~Re-Exam~~ June 2025

Q.6b	A two-winding transformer rated at 9-kVA, 120/90-V, 60-HZ has a core loss of 200 W and a full-load copper loss of 500 W. (a) The above transformer is to be connected as an auto transformer to supply a load at 120 V from 210 V source. What kVA load can be supplied without exceeding the current rating of the windings? (For this part assume an ideal transformer.) (b) Find the efficiency with the kVA loading of part (a) and 0.8 lagging power factor.	10	2	2,3	5
Q.7a	Write short note on i) Skin Effect ii) Ferranti Effect Will these effects be observed in DC system? Justify your answer.	10	2	2,4,5	3,4
Q.7b	"Some power system loads are modelled as constant impedance model whereas some are modelled as constant power model". Justify the statement with example.	10	2	4,5	1,5



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~~END SEMESTER EXAMINATION MAY 2025~~ / Re-Exam June 2025

Duration: 3 hr

Program: TY B. Tech (Electrical)

Maximum Points: 100

Course Code: PC-BTE401

Semester: IV

Course Name: Power Generation, Transmission & Distribution

Note: Question 1 is compulsory; attempt any 4 from remaining 6.

27/6/25

Q. No.	Question	Points	CO	BL	Module No.
	i) What are the units of A, B, C, D constants of a transmission line? (assume any length) Justify. Will they differ for short, medium or long line? Justify [5] ii) For the following effects in power system, which fields (e.g., thermal, magnetic etc.) are responsible and which line parameters (e.g., capacitance, voltage, power loss etc.) are getting affected? Whether efficiency or voltage regulation of transmission line is getting affected by these effects? Write very briefly. [5] a) Skin effect b) Proximity effect c) Ferranti effect d) Corona effect iii) Why is earthing to an equipment & grounding to neutral of supply provided? Normally how much current does flow through equipment grounding cable & the wire connecting neutral to ground? (simply mention in mA / A / kA) Justify. [5] iv) In case a 40W incandescent bulb is connected to 230V AC supply, what is the current? How much will be the current when it is connected to 200V supply? Repeat the same if a 1phase 2HP Induction motor is connected instead. Assume suitable data. Hence comment on load model of bulb & Induction motor.[5]	20	1 to 3	3,4,5	1,3,4,6
Q.2a	Two single-phase ideal voltage sources are connected to two ends a transmission line of impedance of $0.7 + j2.4$ ohm with voltages given as $V_1 = 500 \angle 16.26^\circ$ V and $V_2 = 585 \angle 0^\circ$ V. Find the complex power for each machine and determine whether they are delivering or receiving real and reactive power. Also, find the real and the reactive power loss in the line.	10	2	2,3	1,
Q.2b	A three-phase transmission line has a per phase series impedance of $z = 0.03 + j0.4$ ohm per km and a per phase shunt admittance of $y = j4 \times 10^{-6}$ siemens per km. The line is 125 km long. Obtain the ABCD transmission matrix using Pi model. Determine the receiving end quantities, and transmission efficiency when the line is sending 407 MW, 7.833 Mvar at 350 kV.	10	2	2,3	

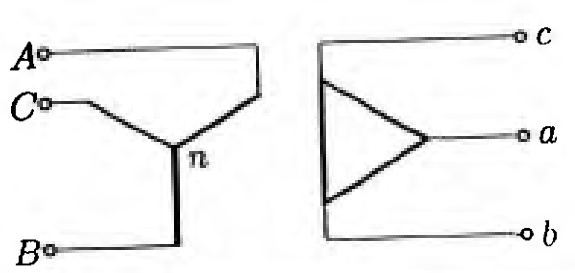


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END SEMESTER EXAMINATION MAY 2025 / Re-Exam June 2025

		10	1	1,2	1
Q.3a	A power station has the following daily load cycle : Time in Hours 6—8 8—12 12—16 16—20 20—24 24—6 Load in MW 20 40 60 20 50 20 Plot the load curve and load duration curve. Also calculate the energy generated per day.	10	1	1,2	1
Q.3b	Draw neatly showing each component of distribution system i.e. feeder, distributor, transformer & service Mains for 1) Radial feeder & 2) Ring main system. (only diagrams) "The Ring main system is more reliable than radial distribution system". Justify.	10	4	1,2,4,5	7
Q.4a	A three phase 60 Hz, 765-kV AC transmission line is 400 km long. The line inductance is 0.88853 mH/km per phase and its capacitance is 0.01268 micro-Farad/km per phase. The line delivers 2000 MVA at 0.8 lagging power factor at 735 kV. Assume lossless line and determine the sending end quantities and voltage regulation using long line model.	10	2	2,3	4
Q.4b	a) Calculate the receiving end voltage when the line given in Q.4a is terminated in an open circuit and is energized with 765 kV at the sending end. b) Determine the reactance and the MVAR of a three phase shunt reactor to be installed at the receiving end to keep the no load receiving end voltage at the rated value.	6	2	2,3	4
Q.4c	Calculate SIL loading for the transmission line mentioned in Q.4a. Find sending end voltage, current in case load is equal to SIL loading. Draw the vector diagram showing voltage and current at receiving & sending end. Hence comment on voltage profile of line under SIL loading	4	2	3,4,5	4
Q.5a	With the help of vector diagram explain the overvoltage phenomena in case a line to ground fault occurs in a 3 phase system with ungrounded neutral. [6m] Suggest the remedy in brief.	10	3	3,4,5	6
Q.5b	For a 3 phase star delta transformer as shown below, draw the vector diagram and hence prove that there is a 30° phase shift between line to line voltage angles of primary and secondary winding. 	4	2	2,3	5



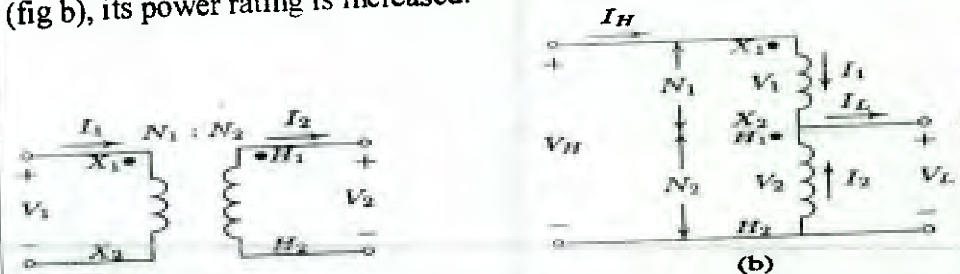
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END SEMESTER EXAMINATION MAY 2025 / Re-Exam June 2025

Q.5c	A 3-phase, 50 Hz, 132 kV overhead line has conductors placed in a horizontal plane 4 m apart. Conductor diameter is 2 cm. If the line length is 100 km, calculate capacitance to neutral & the charging current per phase assuming complete transposition.	6	2	2,3	3
					
Q. 6a	List out all electrical storage systems. Explain working principle, advantages & limitations of pumped hydro storage and battery storage systems.	10	1	2,3	2
Q.6b	Prove that if a 2-winding transformer (fig. a) is used as auto-transformer (fig b), its power rating is increased.	10	2	2,3	5
					
	i.e., $S_{auto} = (1 + \frac{1}{a}) \times S_{2winding}$ where, S_{auto} is power rating of auto-transformer, $a = N1/N2$ & $S_{2winding}$ is power rating of normal two winding transformer				
Q.7a	Draw a neat diagram of construction of a 3 core cable with various layers of protection around it. Explain the purpose of each layer and material used for the same.	10	2	1,2	3
Q.7b	Explain in detail the factors affecting the resistivity of soil. Also discuss the experimental set up used for measurement of earth resistance.	10	3	1,2	6



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END SEM/RE-EXAM EXAMINATION May / June 25

Program: B. Tech (Electrical) *S. Y*

Course Code: PC-BTE402

Course Name: Measurement & Instrumentation *Scoring*

Duration: 3 hrs.

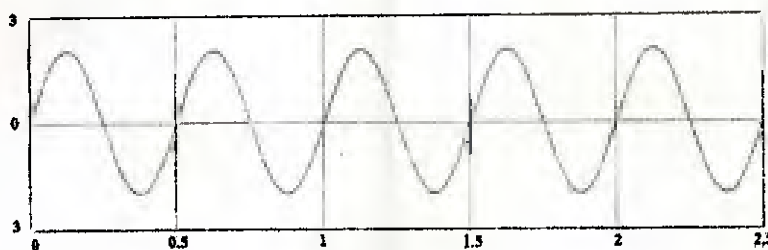
Maximum Points: 100

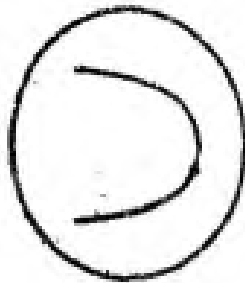
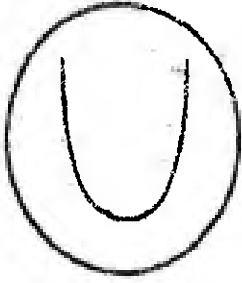
Semester: IV

Notes:

1. Question number 1 compulsory.
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams.
4. Assume suitable data if necessary.

19/5/25

Q. No.	Questions	Pts.	CO	BL	Mod. No.
1. (a)	A 1000/5 A, 50 Hz current transformer has secondary burden comprising a non-inductive impedance of 1.6Ω . The primary winding has 1 turn. Calculate the net flux in the core and ratio error at full load. Neglect leakage reactance and assume the iron loss in the core to be 1.5 W at full load. The magnetizing mmf is 100A.	10	2	L3	3
1. (b)	With the help of neat diagram explain in detail how to measure frequency of given signal using digital frequency meter? 	10	3	L2	5
2. (a)	With the help of neat diagram explain in detail working of dual slope integrating type digital volt meter. What are the advantages of a dual slope integrating DVM over Ramp type DVM?	10	1	L1	5
2. (b)	Draw null and extreme positions of LVDT transducer to get zero, minimum and maximum output voltage.	10	1	L1	6
3. (a)	Explain in detail a five point calibration method with flow chart.	05	1	L1	7
3. (b)	Explain the term: 1. Sampling and holding 2. Quantizing and encoding	05	1	L1	5

3.(c)	Draw and explain the nature of equivalent circuit and corresponding phasor diagram of a current transformer. Derive expressions for the corresponding ratio error.	10	1	L1	3
4.(a)	Find the frequency of the horizontal plates if the frequency applied to vertical plate is 50 Hz for the pattern shown in figure (a) and (b).   (a) (b)	05	1	L2	4
4.(b)	Prove that $G_f = 1 + 2v + \frac{\Delta\rho/\rho}{\varepsilon}$	15	2	L3	0
5. (a)	A Lissajous pattern on the oscilloscope is stationary and has 6 vertical maximum values and five horizontal maximum values. The frequency of horizontal input is 1500 Hz. Determine the frequency of vertical input.	05	1	L1	4
5. (b)	Describe the working principle of the harmonic distortion analyzer. How does it measure the harmonic content of a signal, and what are its typical applications in engineering?	10	1	L2	4
5.(c)	Two watt meters are connected to measure the power consumed by a 3-phase load with a power factor of 0.35. Total power consumed by the load, as indicated by the two watt meters, is 70 kW. Find the individual wattmeter readings.	05	3	L3	1
6.(a)	With the help of neat diagram explain in detail how to measure time interval between two events digitally.	10	1	L1	5
6. (b)	Explain the importance of IEC standards in electrical and electronic measurements. Discuss any two specific IEC standards relevant to measurement systems and their applications.	10	1	L2	7
7. (a)	With the help of a neat diagram and relevant equations, explain in detail how to measure the liquid level using the inductive method . Discuss the working principle, key components, and factors affecting the measurement accuracy.	10	2	L2	6
7. (b)	With the help of neat diagram explain in details construction and working principal of Megger.	10	1	L1	2



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~~BND-SDM~~/RE-EXAM EXAMINATION ~~May~~ / June 25

Program: B. Tech. (Electrical) *S.V. Lcm TV*

Course Code: PC-BTE402

Course Name: Measurement & Instrumentation

Duration: 3 hrs.

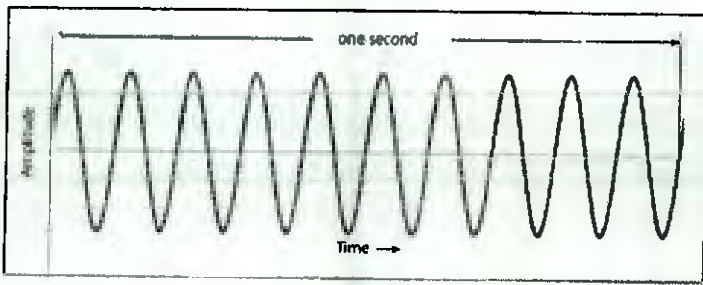
Maximum Points: 100

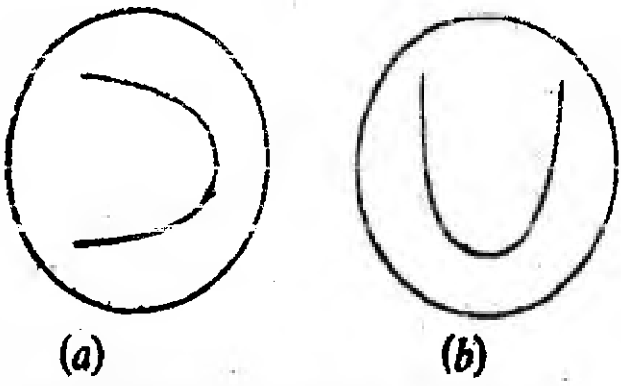
Semester: IV

Notes:

1. Question number 1 compulsory.
2. Attempt any **four** questions out of remaining six.
3. Draw neat diagrams.
4. Assume suitable data if necessary.

25/4/25

Q. No.	Questions	Pts.	CO	BL	Mod. No.
1. (a)	With the help of neat diagram explain in detail how to measure frequency of given signal using digital frequency meter? 	10	3	L2	5
1.(b)	A 1000/5 A, 50 Hz current transformer has secondary burden comprising a non-inductive impedance of 1.6Ω . The primary winding has 1 turn. Calculate the net flux in the core and ratio error at full load. Neglect leakage reactance and assume the iron loss in the core to be 1.5 W at full load. The magnetizing mmf is 100A.	10	2	L3	3
2.(a)	Explain the importance of IEC standards in electrical and electronic measurements. Discuss any two specific IEC standards relevant to measurement systems and their applications.	10	1	L2	7
2.(b)	Draw the block diagram of a Quality Factor (Q-Factor) Meter and explain the role of each block in its operation.	10	2	L1	4
3. (a)	With the help of neat diagram explain in detail working of ramp type digital volt meter.	10	1	L1	5

3.(b)	Draw null and extreme positions of LVDT transducer to get zero, minimum and maximum output voltage.	10	1	L1	6
4. (a)	With the help of neat diagram explain in details construction and working principal of Megger.	10	1	L1	2
4. (b)	With the help of a neat diagram, explain in detail the most suitable method for the measurement of the level of distilled water, considering its poor electrical conductivity	10			6
5. (a)	A Lissajous pattern on the oscilloscope is stationary and has 6 vertical maximum values and five horizontal maximum values. The frequency of horizontal input is 1500 Hz. Determine the frequency of vertical input.	05	1	L1	4
5.(b)	Prove that $G_f = 1 + 2\nu + \frac{\Delta\rho/\rho}{\varepsilon}$	15	2	L3	6
6. (a)	Draw and explain the nature of equivalent circuit and corresponding phasor diagram of a current transformer. Derive expressions for the corresponding ratio error and phase angle error.	15	1	L1	3
6.(b)	Explain in detail a five point calibration method with flow chart.	05	1	L1	7
7. (a)	With the help of a neat diagram and relevant equations, explain in detail how to measure the liquid level using the inductive method . Discuss the working principle, key components, and factors affecting the measurement accuracy.	10	2	L2	6
7.(b)	Find the frequency of the horizontal plates if the frequency applied to vertical plate is 50 Hz for the pattern shown in figure (a) and (b).  (a) (b)	05	1	L2	4
7.(c)	A moving-coil instrument whose resistance is 25Ω gives a full-scale deflection with a voltage of 25 mV. This instrument is to be used with a series multiplier to extend its range to 10 V. Calculate multiplier resistance value?	05	2	L2	1



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END SEMESTER/RE-EXAMINATION MARCH 2025



Program: S.Y. B.Tech.

Electrical Engg IV

Duration: 3 Hour.

Course Code: PC-BTE403

Maximum Points: 100

Course Name: Electrical Machines-I (R23)

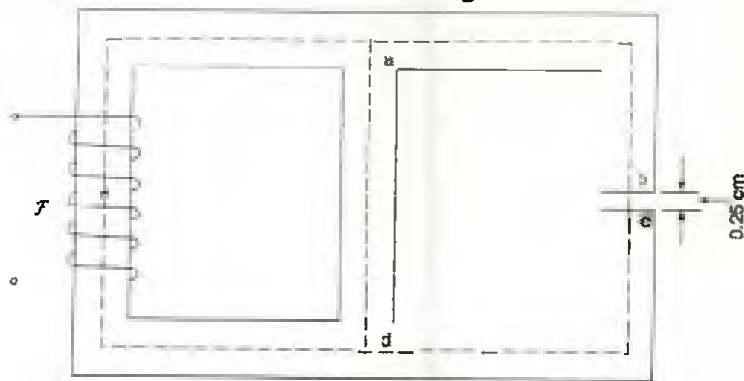
Semester: IV

Notes:

1. Question No. 1 is compulsory.
2. Solve any four questions from remaining six.
3. Draw neat diagrams wherever necessary.
4. Assume suitable data if necessary.

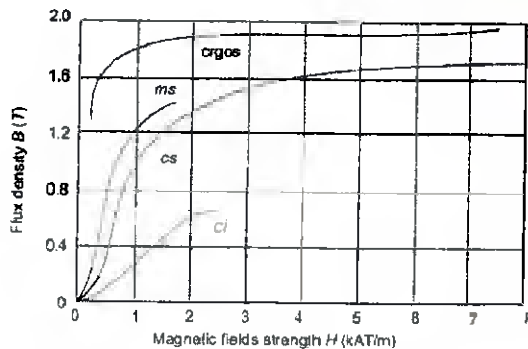
21/5/25

Q.No.	Questions	Points	CO	BL	Module No.
Q.1	Answer any four.				
a.	Discuss effects of hysteresis and saturation in magnetic circuit.	05	1	1,2	1
b.	Explain the importance of polarity test in a transformer.	05	2	1,2	6
c.	Explain, in brief, armature reaction in DC machines.	05	3	1,2	4
d.	Draw the operating characteristics of separately excited DC Generator.	05	3	1,2	5
e.	Derive the expression for magnetic force from energy.	05	1	1,2,3	3
Q.2	a. The magnetic circuit of figure given below has a cast steel core whose dimensions are given below: Length $(ab + cd) = 50$ cm Cross-sectional area = 25 cm^2 Length $ad = 20$ cm Cross-sectional area = 12.5 cm^2 Length $dea = 50$ cm Cross-sectional area = 25 cm^2 Determine the exciting coil mmf required to establish an air-gap flux of 0.75 m Wb . Use the B-H curve given below.	10	1	1,2,3	1





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END SEMESTER/RE EXAMINATION MARCH 2025



Explain and justify Phasor Group I in detail.

b.

10

3

6

Q. 3

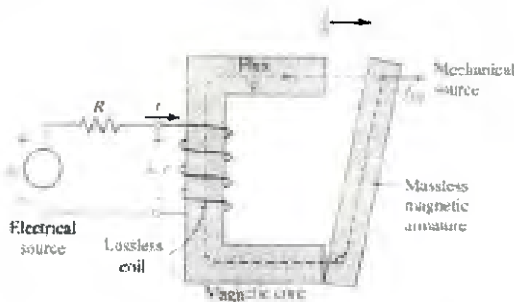
- a. Derive the expression for energy in a singly-excited magnetic field system as shown below. Extend it for linear magnetic system.

10

1

1,2,3

3



b.

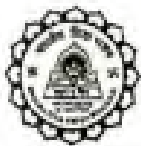
A 600-kVA, single-phase transformer with 0.012 pu resistances and 0.06 pu reactance is connected in parallel with a 300-kVA transformer with 0.014 pu resistance and 0.045 pu reactance to share a load of 800 kVA at 0.8 pf lagging. Find how they share the load;

10

3

6

- a) when both the secondary voltages are 440 V.
b) when the open-circuit secondary voltages are respectively 445 V and 455 V.



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END SEMESTER/RE-EXAMINATION MARCH 2025



4.	a.	A d.c. generator has 24 armature conductors. Average e.m.f. induced in one conductor is 2 V and each conductor is designed to handle a current of 5 A. Calculate the rating generator if number of parallel paths in this machine are (a) 2 (b) 4 and (c) 6.	3+3+4	2	1,2,3	5
	b.	Define/Explain the following terms a. Angular slot pitch b. Pitch Factor c. Distribution Factor d. Winding Factor e. Vector Groups	10	2		4,5
5.	a.	A 230-V, d.c. shunt motor, takes an armature current of 3.33 A at rated voltage and at a no-load speed of 1000 r.p.m. The resistances of the armature circuit and field circuit are respectively 0.3 ohm and 160 ohm. The line current at full load and rated voltage is 40 A. Calculate, at full load, the speed and the developed torque in case the armature reaction weakens the no-load flux by 4%.	10 10	2	1,2,3	5
	b.	Classify the DC Machines based on excitation.		2		5
6.	a.	Justify the use of commutator in dc machines.	10	2	1,2,3	4,5
	b.	Define the MNA and GNA. Discuss the positions of MNA and GNA with and without armature reaction. Justify the reason for keeping brush positions at MNA.	10	2		4,5
7.	a.	Discuss operating characteristics of DC Shunt Motor.	10	2	1,2,3	4,5
	b.	A 20 kVA, 2500/250 V, 50 Hz, single-phase transformer gave the following Open-circuit test (on l.v. side) : 250 V, 1.4 A, 105 watts. Short-circuit test (on h.v. side) : 104 V, 8 A, 320 watts. Compute the parameters of the approximate equivalent circuit referred to high-voltage and low-voltage sides. Also draw the exact equivalent circuit referred to the low-voltage side.		2		6



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~~END SEMESTER~~ RE EXAMINATION ~~MARCH~~ 2025 *June*

Program: S.Y. B.Tech.

Duration: 3 Hour.

Course Code: PC-BTE403

Maximum Points: 100

Course Name: Electrical Machines-I (R23)

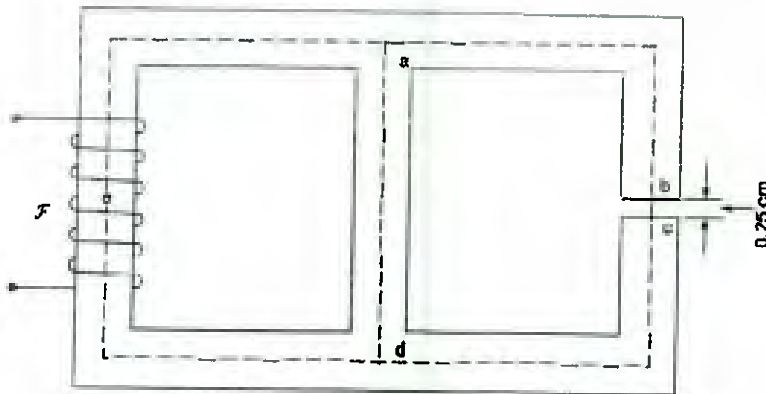
Semester: IV

Notes:

1. Question No. 1 is compulsory.
2. Solve any four questions from remaining six.
3. Draw neat diagrams wherever necessary.
4. Assume suitable data if necessary.

24/6/25

Q.No.	Questions	Points	CO	BL	Module No.
Q.1	Answer any four.				
a.	Explain eddy current losses in magnetic circuit.	05	1	1,2	1
b.	Explain Core loss resistance and magnetizing reactance in transformer.	05	2	1,2	6
c.	Explain, in brief, armature reaction in DC machines.	05	3	1,2	4
d.	Draw the operating characteristics of shunt DC Generator.	05	3	1,2	5
e.	Derive the expression for magnetic force from energy.	05	1	1,2,3	3
Q.2 a.	The magnetic circuit of figure given below has a cast steel core whose dimensions are given below: Length $(ab + cd) = 50$ cm Cross-sectional area $= 25$ cm² Length $ad = 20$ cm Cross-sectional area $= 12.5$ cm² Length $dea = 50$ cm Cross-sectional area $= 25$ cm² Determine the exciting coil mmf required to establish an air-gap flux of 0.75 m Wb. Use the B-H curve given below.	10	1	1,2,3	1





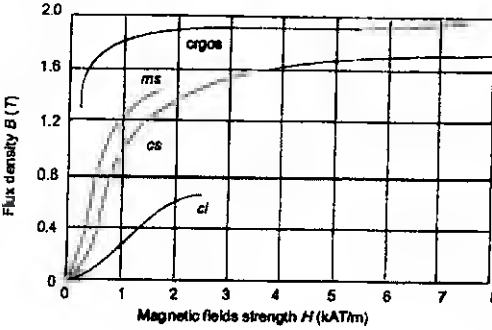
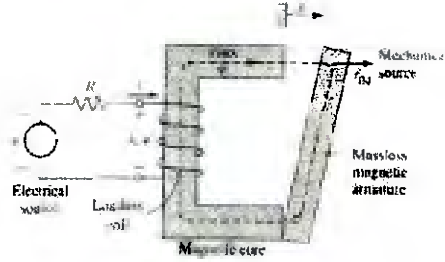
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~~END SEMESTER/RE EXAMINATION~~ **MARCH 2025**



b.	 Explain and justify Phasor Group 3 in detail.	10			
Q. 3 a.	Derive the expression for energy in a singly-excited magnetic field system as shown below. Extend it for linear magnetic system.  A 33 kVA, 2200 / 220 V, 50 Hz single phase transformer has the following parameters Primary winding (h.v. side) : resistance $r_1 = 2.4 \text{ ohm}$ leakage reactance $x_1 = 6.00 \text{ ohm}$ Secondary winding (l.v. side) : resistance $r_2 = 0.03 \text{ ohm}$ leakage reactance $x_2 = 0.07 \text{ ohm}$ (a) Find the primary resistance and leakage reactance referred to secondary. (b) Find the secondary resistance and leakage reactance referred to primary. (c) Find the equivalent resistance and equivalent leakage reactance referred to primary and secondary. (d) Calculate the total ohmic loss at full load. (e) Calculate the voltage to be applied to the h.v. side, in order to obtain a short circuit current of 160A in the l.v. winding. Under these conditions, find the power input also.	10	3	1,2,3	6
b.		10	3		6



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~~END SEMESTER~~ **RE EXAMINATION** ~~MARCH~~ **JUNE 2025**

4. a.	A 2-pole d.c. shunt generator charges a 100-V battery of negligible resistance. The armature of the machine is made up of 1000 conductors, each of 2 milli-ohm resistance. The charging currents are found to be 10A and 20A for generator speeds of 1055 and 1105 rpm respectively. Find the field circuit resistance and flux per pole of the generator. Neglect armature reaction effects.	10	2	1,2,3	5
b.	Define/Explain the following terms a. Angular slot pitch b. Pitch Factor c. Distribution Factor d. Winding Factor e. Vector Groups	10	2		4,5
5. a.	A 230-V, d.c. shunt motor, takes an armature current of 3.33 A at rated voltage and at a no-load speed of 1000 r.p.m. The resistances of the armature circuit and field circuit are respectively 0.3 ohm and 160 ohm. The line current at full load and rated voltage is 40 A. Calculate, at full load, the speed and the developed torque in case the armature reaction weakens the no-load flux by 4%.	10	2	1,2,3	5
b.	Classify the DC Machines based on excitation.	10			
6. a.	Justify the use of commutator in dc machines.	10	2		5
b.	Define the MNA and GNA. Discuss the positions of MNA and GNA with and without armature reaction. Justify the reason for keeping brush positions at MNA.	10	2		4,5
			2		4,5
7. a.	Discuss operating characteristics of DC Series Motor.				
b.	The equivalent circuit referred to the low-tension side of a 250/2500 V single phase transformer is shown in Fig below. The load impedance connected to the high-tension terminals is $380 + j 230$ ohm. For a primary voltage of 250 V, compute (a) the secondary terminal voltage, (b) primary current and power factor, and (c) power output and efficiency.	10	2	1,2,3	4,5
			2		6



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~~END SEMESTER~~ RE EXAMINATION ~~MARCH~~ 2025
June

	V_1 500Ω 250Ω 0.2 0.7 $\frac{N_1}{N_2}$				
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End/Reexam Semester AY2024-2025

	4. Explain functions of various internal registers available in 8051. 5. How are the interrupts dealt by 8051? State different interrupt signals available with 8051 in the order of priority from lowest to highest. 6. How many register banks are available in RAM of 8051. Explain how the particular bank is selected.	04 04 04			
3 a	Write a program 1. To add 6 BCD numbers stored in memory from location 6000H 2. Unpack digits of packed BCD number '78' 3. Count number of zeros in a given 8 bit number stored in memory location 6000H 4. The result of signed arithmetic operation is stored in RAM location 40H. Verify if the result is positive or negative. If result is positive send high to P1.7 otherwise send a low value.	16	2	3	3,4
b	Find the delay provided by the following loop with 8051 if the crystal frequency is 11.0592MHz Delay: MOV R5, #9 Here1: MOV R4, #242 Here2: MOV R3, #255 Here3: DJNZ R3, Here3 DJNZ R4, Here2 DJNZ R3, Here1 RET [Note Machine cycles for MOV Rn, #value=1, DJNZ=2, RET=2]	04	2	3	3,4
4 a	With a neat block diagram explain 8051 architecture	10	1	2	2
b	Identify addressing mode in each case 1. MOV DPTR, #4000H 2. MOV R1, DPL 3. MOV A, @R0 4. MOVC A, @A+DPTR	05	2	2	3



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End/Reexam-Semester AY2024-2025

5. MOV R0, 40H					
c	Explain the concept of stack. Show the stack with addresses and content of SP after execution of the following instructions. MOV R6, #45H MOV R1, #78H MOV R4, #0F3H PUSH 6 PUSH 1 PUSH 4	05	2	3	4
5 a	Design memory interfacing for 8051 to have 8KByte of ROM using 4Kbyte of ROM chip and 4Kbyte of RAM using 2Kbyte of RAM chip. Design should include memory mapping, decoding logic, complete interfacing diagram	15	3		5
b	If "Y" is to be transferred serially at 9600 baud rate. What should be the contents of TMOD, TH1, SCON and SBUF? The crystal frequency is 11.0592 MHz	05	2	3	6
6 a	A 4x4 key board matrix is connected to 8051. Port 0 is used as input port and port 1 is used output port. Let the keys indicate alphabets 'A' to 'P'. Show the interfacing diagram.[Key allocation is as per your choice]. Write the steps to check if the key is pressed and then to identify which key is pressed. Write the code for the same	15	3	3	7
b	Write a code to rotate stepper motor for two revolutions in four step sequence. Assume stepper motor moves 1.8 degrees per step	05	3	3	7
7 a	For the following interfacing diagram, determine the addressess of Port A, B, C and control register of 8255. Write a code to transfer status of switches connected to PB0, PB1, PB2, PB3 to LEDs connected to PC0, PC1, PC2, PC3 of 8255	6	3	3	5



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End/Reexam Semester AY2024-2025

Program: B. Tech Electrical *sem IV*

Course Code: PC-BTE404

Course Name: Microprocessor and Microcontroller

Duration: 3 Hr

Maximum Points: 100

Semester: IV

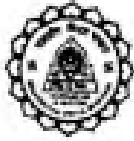
Note: Q1 is compulsory. Solve any four questions out of remaining six questions

Assume suitable data if required.

The comments should be written while writing programs/codes

17/12

Q. No	Questions	Poi nts	CO	BL	Modul e no
1	a. The contents of R0 and A are 20H and 30 H respectively What will be the contents of A and R0 after execution of ADD A, R0 MOV R0,A ADD A,R0 b. How are timers 0 and 1 started and stopped by instructions? c. Common anode LED is connected to port 1. Write a code to display "C" on LED display. d. Explain SCON register setting used for serial communication e. Explain any three logical instructions f. Explain 1. Instruction RET 2. I/O ports of 8051	03 05	1-3	2	1-7
2	Answer the following 1. What are the functions of the pins TxD and RxD? 2. What is the function of EA signal? 3. Write a program to get byte from port1 and send it to port 2 4. Draw block diagrams of general purpose microprocessor and a microcontroller. 5. Explain various bits of Interrupt Enable (IE) register. Write IE register content when external interrupt 1 is enabled.	02 02 04 04 04	1		1,2



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End/Reexam Semester AY2024-2025

	6. How many bytes of RAM is available with 8051? Explain its organization?	04			
3 a	Write a program 1. To clear 10 RAM locations from the address 60H 2. Write a program to take data serially from port 0 and send it in parallel to port 1 3. Read 4 bit data from P0.0 to P0.3. Display the same on LED connected to P1.4 to P1.7 4. To arrange 5 numbers stored from memory location 6000H in ascending order	16	2	3	3,4
b	For an 8051, with crystal frequency 22 MHz, generate a delay of 5ms. [Note Machine cycles for MOV Rn, #value=, DJNZ=2, RET=2]	04	2	3	3,4
4 a	1. Show the status of carry, auxiliary carry and parity flags after the execution of following instructions MOV A,#9EH ADD A,#74H 2. Explain how PSW register is used for register bank selection. Write instruction to select bank2 3. Explain the execution of ACALL instruction	03 03 04	1	2,3	2,3
b	With an example explain the following addressing modes 1. Immediate 2. Register 3. Direct 4. Register Indirect 5. Indexed	10	2	2	3
5 a	Design memory interfacing for 8051 to have 4Kbyte of ROM using 2Kbyte of ROM chip and 16Kbyte of RAM using 8Kbyte of RAM chip. Design should include memory mapping, decoding	15	3	3	5



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End/Reexam Semester AY2024-2025

	logic, complete interfacing diagram				
b	If "D" is to be transferred serially at 2400 baud rate. What should be the contents of TMOD, TH1, SCON and SBUF? The crystal frequency is 11.0592 MHz	05	3	3	6
6 a	A 3x3 key board matrix is connected to 8051. Port 0 is used as input port and port 1 is used output port. Let the keys indicate numbers 1 to 9. Show the interfacing diagram.[Key allocation is as per your choice]. Write the steps to check if the key is pressed and then to identify which key is pressed. Write the for the same	15	3	3	7
b	How the addresses of port A, B, C and control word register are identified in 8255? Explain Control Word Register of 8255	05	3	2	5
7 a	Show interfacing of 8051 with stepper motor. Write a code to run stepper motor in full drive mode	06	3	3	7
b	Explain the function of the following pins of ADC chip, Also, write whether the pins are input or output to ADC 1. Pins A, B, C 2. Pin EOC 3. Pins IN0 to IN7 4. Pin D0 to D7 5. Pin OE 6. Pin SC	06	3	3	5
c	Write a program that continuously gets 8 bits from port 0 and sends the same to port 1 while simultaneously generate a square wave of 200 microseconds at P2.1. Use timer 0 to create square wave. Assume crystal frequency 11.0592 MHz.	08	2	3	5



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End Semester 2025 Examinations / Reexam



SET A

Program: CME *S.Y Sem IV*
Course Code: MI BT013
Course Name: Minor in Management

Duration: 03 hours
Maximum Points: 100
Semester: IV

Note:

- Question 01 is compulsory
- Attempt any four questions out of remaining 06 question

26/5/25

Q.No.	Questions	Point s	CO	B L	Modu le No
Q.1.	Write in not more than 150 words on the following topics. (10 each) 1. Give Contributions of Kautilya related to management. 2. Explain with diagram the functional foremanship given by Taylor 3. Leadership Theories 4. Principles and techniques of coordination 5. What is departmentation? Describe various bases of departmentation	20	01,2 ,	01	1,2,3, 4,5,
Q.2.A	Explain in detail Mintzberg's roles and functions of managers through a hierarchical diagram.	10	01	L3	01
Q.2.B	Explain in detail the systems approach to Management. Write any 05 differences between open and closed system.	10	02	L2	03
Q.3.A	Explain the relationship and distinction between management and Administration.	10	01	L1	03
Q.3.B	How will you classify the levels of Management in an organization? Describe the functions performed by different levels of Management.	10			
Q.4. A	Design the Matrix organization structure. Explain the advantages and disadvantages of the structure	10	03	L1	04
Q.4.B.	What are the basic characteristics of formal and informal organization? How does informal organization differ from formal organization?	10	02	L2	04
Q.5. A	What are the essential features of a good plan? Elaborate the steps to effective planning.	10	04	L5	02
Q.5.B.	Explain different types of managerial decisions briefly. Explain the steps for rational decision making.	10	04	L5	02

Q.6. A	Multiple Choice Questions: - Which of the following best describes the difference between power and authority in management? A. Power is formal; authority is informal. B. Power is based on position; authority is based on personal traits. C. Power is the ability to influence others; authority is the formal right to make decisions. D. Authority is always greater than power. - What type of power is derived from a person's position in the organizational hierarchy? A. Expert Power B. Referent Power C. Legitimate Power D. Coercive Power - Which of the following is an example of referent power in a workplace setting? A. A manager punishing an employee for poor performance. B. A team leader admired and respected by their peers. C. An IT specialist with unique technical knowledge. D. A supervisor issuing orders based on company policy. - What is delegation of authority? A. Transferring all decision-making to a higher authority. B. Assigning tasks without any responsibility. C. Granting a subordinate the power to make decisions within a defined scope. D. Taking over the responsibilities of a subordinate. - Which type of power is most likely to result in long-term commitment and motivation among employees? A. Coercive Power B. Reward Power C. Legitimate Power D. Expert Power	10	03	L4	05
Q.6.B.	What do you mean by power and authority? Explain in detail the bases power in an organization	10	03	02	05
Q.7. A.	Case Study Background Infosys Ltd., founded in 1981 by Narayana Murthy and a group of engineers in Pune, India has grown into a global leader in IT services	10	03	04	06

and consulting. The company is known for its emphasis on innovation, ethical practices, and a strong employee-centric culture, navigating significant growth and global expansion over the years.

Leadership Evolution

1. Narayan Murthy Era (1981-2002)

- Leadership style: Visionary and Entrepreneurial
- Achievements: He established Infosys with a focus on quality, Integrity, and client satisfaction. He laid the foundation for a values-driven culture and global expansion.
- Challenges: Managing rapid growth, scaling operations globally, and maintaining organizational culture amid technological advancements.

2. Nandan Nilekani and Leadership Transitions (2002-2014)

- Leadership Style: Strategic and Transformational
- Initiatives: He transformed Infosys into a global IT services giant, emphasizing scalability, digital transformation and client –centricity.
- Challenges: Adopting to evolving technology landscapes, talent management, and leadership succession.

3. Vishal Sikka Era (2014-2017)

- Leadership Style: Innovative and Technologically driven
- Innovations: Sikka focused on Ai. Automation, and digital platforms to enhance Infosys' competitive edge.
- Challenges: Overcoming internal resistance to change, cultural integration, and meeting high growth expectations amidst industry disruption.

4. Current Leadership (2018-present)

- Leadership focus: Continuity and growth under Salil Parekh
- Priorities: Parekh emphasizes digital transformation, client relationships, talent development, and sustainability.
- Current Challenges:
 - Cultural Integration: Infosys faces challenges in integrating diverse global cultures, impacting organizational cohesion.
 - Operational efficiency: Balancing technological innovation with operational efficiency remains crucial for meeting client demands.
 - Market Competition: Intense competition in the IT sector requires continuous innovation and differentiation.

	▪ Regulatory Compliance: Adapting to changing global regulatory requirements poses challenges in compliance and risk management. ▪ Leadership Transition: Smooth leadership transitions and maintaining strategic focus during changes are vital for sustained growth. <i>Impact of Leadership and organizational Culture:</i> • Innovation: Infosys continues to drive innovation in digital solutions, AI and cloud service. • Employee Development: The company invests in talent development through leadership programs and a culture of continuous learning. • Ethical Standards: Infosys upholds high ethical standards and corporate governance practices. <i>Questions:</i> 1. How did Narayan Murthy's visionary and entrepreneurial leadership style shape the foundational values and global expansion of Infosys? 05 2. How has Infosys maintained its commitment to ethical standards and corporate governance while navigating leadership transitions and global market dynamics? 05				
Q.7. B	Write short notes on any two: 1. Strategic and Operational Control. (Difference) 2. Challenges faced by managers in twenty first century related to internal and external environment 3. Management by Objectives (MBO) 4. Difference between Business Ethics and Social Responsibility	10	01	02	07



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End Semester 2025 Examinations *Re-examination*

SET B

Program: CME

Course Code: MI BT01

Course Name: Minor in Management

Duration: 03 hours

Maximum Points: 100

Semester: IV

Note:

- Question 01 is compulsory
- Attempt any four questions out of remaining 06 questions

30/6/25

Q.No.	Questions	Points	CO	BL	Module No
Q.1.	Write in not more than 150 words on the following topics. (10 each) 1. Management as an art, Science and profession. 2. Explain the systems approach to management. Bring out the difference between open and closed system. 3. Explain the concept of "Bounded Rationality". What are the factors leading to Bounded rationality 4. What do you mean by Span of management? As a manager, do you prefer wide or narrow Span? Give reasons	20	01,2	01	1,2,3,4,5,
Q.2.A.	Explain the 14 principles of Management given by Henry Fayol	20	01	L3	01
Q.3.A.	Discuss the contributions of Hawthorne Experiments' in the development of managerial thinking. How did Behavioural scientists modify the basic findings of Hawthorne's Experiments	10	02	L2	03
Q.3.B.	How does long term planning differ from short term planning? How can both be coordinated?	10	01	L1	03
Q.4. A	Explain the Circular organization Structure and Team based organization structure with figures. Describe its Advantages and Disadvantages.	10	03	L1	04
Q.4.B.	What are the basic characteristics of formal and informal organization? How does informal organization differ from formal organization?	10	02	L2	04

Q.5. A	1. Which of the following best defines planning in management? A) Recruiting and training employees B) Setting objectives and deciding in advance the appropriate actions to achieve them C) Monitoring organizational performance D) Coordinating between different departments 2. What is the primary purpose of decision-making in management? A) To avoid responsibility B) To assign blame during failures C) To choose the best course of action among alternatives D) To delay organizational changes 3. Which of the following is NOT a characteristic of planning? A) Goal-oriented B) Future-focused C) Reduces uncertainty D) Avoids resource allocation 4. Strategic planning is typically concerned with: A) Daily routines and operations B) Hiring new staff C) Long-term goals and the overall direction of the organization D) Supervising lower-level employees 5. In the decision-making process, the step that comes immediately after identifying the problem is: A) Implementing the decision B) Evaluating the decision C) Developing alternatives D) Selecting the best alternative	10	04	L5	02
Q.5.B.	What are the essential characteristics of an effective decision making? How can a manager make effective decisions?	10	04	L5	02
Q.6. A	Explain the difference between positional power and personal power? Illustrate with examples the types of both powers.	10	03	L4	05
Q.6.B.	Describe the features of delegation of authority. What steps are followed in delegation of authority?	10	03	02	05
Q.7.A.	Case Study Overview The Tata group, established in 1868 by Jamshetji. Tata is one of India's largest and most influential conglomerates. With operations spanning more than hundred countries and industries as diverse as steel, automotive, information, technology, hospitality, and consumer goods, Tata group exemplifies the integration of power and authority in a major corporate entity. Leadership Legacy	10	03	04	06

The power and authority of Tata group are significantly influenced by its leadership legacy. Founder such as Jamsetji Tata set a high standard with their vision of industrialization and social responsibility. This vision was carried forward by subsequent leaders like JRD Tata and Ratan Tata Their leadership emphasized not just strategic foresight, but also a commitment to ethical business practices and innovation, establishing a strong foundation for the groups, ongoing influence and authority in various markets.

Corporate structure, and Governance

Tata group operates through a network of hundred companies, each functioning with a degree of operational independence, but aligned with the groups strategic goals. This structure allows individual entities to respond flexibility to market conditions, while maintaining coherence with the overarching strategic direction of the group governance is overseen by the Tata trust which enforce high standards of transparency and accountability, reinforcing the groups authority by ensuring that it's operations adhere to its core values and ethical standards.

Ethical standards and Corporate Social Responsibility(CSR)

The group's commitment to ethical practices and CSR is integral to its power dynamics Tata group prioritizes, social responsibility, integrating it into its business model rather than treating it as an ancillary activity. For instance, Tata steels initiatives in community development and Tata Consultancy Services TCS employee welfare programs demonstrate how the group CSR activities enhance its reputation and influence fostering trust and goodwill among stakeholders

Strategic Diversification

Strategic diversification is a cornerstone of Tata Groups authority. By investing across various sectors, from automotive to IT and consumer goods, Tata group effectively manages financial risk and capitalizes on growth opportunities. This approach not only mitigates the impact of market volatility, but also strengthens the groups competitive position. Notable examples include Tata motors acquisition of Jaguar Land Rover and the expansion of TCS into new markets, showcasing, how diversification support supports the groups of global strategy and market influence.

Global presence

	Tata group substantial international presence amplifiers its global authority operating in over hundred countries the group leverages, global market, opportunities and maintenance a competitive edge through its widespread footprint. The ability to adapt a different regulatory environments and cultural context, further enhances status influence and strategic positioning in the global market Conclusion, the Tata groups authority is shaped by combination of visionary leadership, a robust and flexible, corporate structure, a strong commitment to ethical practices and CSR, strategic diversification and a significant global presence. These elements collectively contribute to the groups, powerful position, both domestically and internationally. Questions 1. How have Tata group's historical leaders influenced its strategic direction and operational authority? 02 2. What benefits does Tata groups decentralized corporate structure offer in terms of governance and flexibility? 03 3. What role does Tata groups global presence play in? Enhancing its strategic authority and market influence internationally? 05				
Q.7. B	Write short notes on any two: 1. Difference between Business Ethics and Social Responsibility 2. Strategic and Operational Control. (Difference) 3. Challenges faced by managers in twenty first century related to internal and external environment 4. Describe various principles of coordination.	10	01	02	07



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Program: **Electrical Engineering** *S.Y. Sem IV*
 Course code: **PC-BTE405**
 Name of the Course: **Signals and Systems**

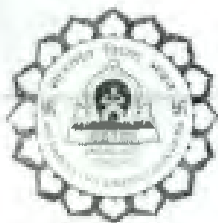
End Sem/Re-Exam May June 2025
 Duration: 3 Hour
 Maximum Marks: 100
 Semester: IV

- Solve any five questions out of seven.
- Answers to all sub questions should be grouped together.
- Make suitable assumptions whenever necessary. State them clearly.
- Diagrams drawn to support your answer should be clearly visible.

28/7/25

Q. No.		Pts	CO	BL	Module
1	Determine whether the following signal is periodic. If a signal is periodic, determine its fundamental period. $x(t) = 2 \cos(3t) + 3 \sin(7t)$	5	1	3	1
(i)					
(ii)	Given $y_1[n] = [1, 4, -3, 0, 7]$, $x_1[n] = [2, 1, 1.5, 3]$ Plot $y_1[n] + 2x_1[n-1]$	5	1	3	1
(iii)	Determine whether $u[n]$ is an energy signals, power signals, or neither.	5	1	3	1
(iv)	Determine whether the following system is static / dynamic, stable/unstable, causal / non causal, linear / nonlinear, TV/TIV. Justify. $\frac{dy(t)}{dx(t)} + 5y(t) = x(t)$	5	1	3	1
2	The impulse response $h[n]$ of a discrete-time LTI system is shown below. .	6	1	3	2, 6
(i)	Determine the output $y[n]$ of this system to the input $x[n]$ as given. (a) using ZT (b) without using ZT.				

(ii)	Find the cross correlation of $x(n) = \{1, 2, 3\}$ and $h(n) = \{2, 0, 1\}$ (i) using Z.T. (ii) Without using Z.T.	6	3	3	2
(iii)	For the following difference equations and associated input and initial conditions, determine the zero state response.	8	1	3	2, 6
$y[n] - \frac{1}{2}y[n-1] = x[n]$, with $x[n] = (\frac{1}{3})^n$, $y[-1] = 1$					
3A	Determine Fourier series for the $f(x) = x$ for $-\pi \leq x < \pi$	10	3	3	3
B	Plot $\text{sgn}(t)$. Determine the FT of $\text{sgn}(t)$. Plot the magnitude response.	10	3	3	3
4	Derive LT of $u(t)$. Using Laplace transform properties, obtain the Laplace transform of $x(t) = t e^{-at} u(t)$. State the properties used.	4	2	3	4
(i)					
(ii)	Find initial and final values of the signal with transform given as $X(s) = \frac{s+10}{s^2+3s+2}$	6	2	3	4
(iii)	Consider a CT LTI system for which the input $x(t)$ and output $y(t)$ are related by $y''(t) + y'(t) - 2y(t) = x(t)$ (a) Find the system function $H(s)$. (b) Determine the impulse response $h(t)$ for the system to be (i) causal (ii) stable (iii) neither causal nor stable.	10	2	3	4
5	Determine the impulse response of DTLTI system defined by (i) $H(z) = (3 - 4z^{-1}) / (1 - 3.5z^{-1} + 1.5z^{-2})$. Specify the ROC of $H(z)$ and determine $h(n)$ for the following condition (a) The system is stable (b) The system is causal (c) The system is anticausal.	15	2	3	5
(ii)	The output $y[n]$ of a discrete-time LTI system is found to be $2(1/3)^n u[n]$ when the input $x[n]$ is $u[n]$. Find the impulse response $h[n]$ of the system.	5	2	3	6
6(i)	Explain the mapping between the s-plane and the z-plane.	8	2	1	6
(ii)	Find the impulse response $h[n]$ for the causal DTLTI system satisfying the following difference equation. (i) using ZT (ii) without using ZT. Also determine whether system is a FIR or an IIR system. $y[n] = x[n] - 2x[n-2] + x[n-3]$	6	2	2	2, 6
(iii)	Plot poles and zeros of $F(s)$. Obtain $f(t)$. $F(s) = \frac{(s+1)(s+3)}{(s+2)(s+4)}$	6	4	3	4
7	Realize using DF I, DF II, cascade and parallel realization. $y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1)$	20	2	3	7

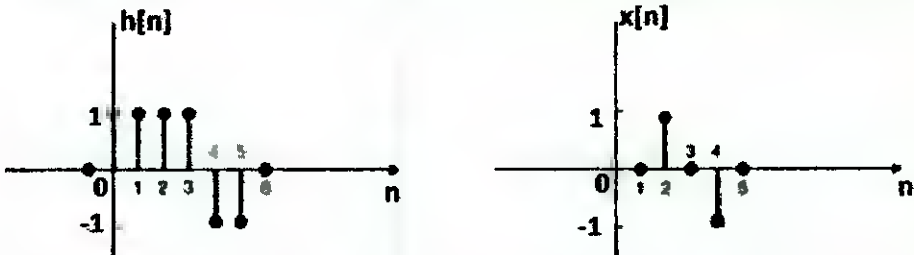


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Program: Electrical Engineering *Sem IV*
Course code: PC-BTE405
Name of the Course: Signals and Systems

Duration: 3 Hour
Maximum Marks: 100
Semester: IV

- Solve any five questions out of seven.
- Answers to all sub questions should be grouped together.
- Make suitable assumptions whenever necessary. State them clearly.
- Diagrams drawn to support your answer should be clearly visible.

Q		Pts	CO	BL	Module
1	Determine whether the following signal is periodic. If a signal is periodic, determine its fundamental period. $x(t) = \cos\left(\frac{\pi}{3}t\right) + \sin\left(\frac{\pi}{4}t\right)$	5	1	3	1
(ii)	Given $x_1[n] = [1, 0, -3, 0, 7]$, $x_2[n] = [1, 1, 1.5, 4]$ $\uparrow \qquad \qquad \qquad \uparrow$ Plot product of $x_1[n-1]$ and $x_2[n+1]$	5	1	3	1
(iii)	Determine whether $x(t)$ is an energy signals, power signals, or neither. $x(t) = e^{-at} u(t)$, $a > 0$	5	1	3	1
(iv)	Determine whether the following system is static / dynamic, stable/unstable, causal / non causal, linear / nonlinear, TV/TIV. Justify. $T[x(n)] = ax(n) + b$	5	1	3	1
2	For a DTLTI system, the impulse response $h[n]$ and input $x[n]$ is as given.	6	2	3	2, 6
(i)	Determine the output $y[n]$ (a) using ZT (b) without using ZT. 				
(ii)	Determine autocorrelation of the sequence $x(n) = \{1, 2, 1, 1\}$ (i) using Z.T. (ii) Without using Z.T.	6	2	3	2, 6
(iii)	For the following difference equations and associated input and initial conditions, determine the zero input response. $y[n] - \frac{1}{2}y[n-1] = x[n]$, with $x[n] = \left(\frac{1}{3}\right)^n$, $y[-1] = 1$	8	1	3	2, 6

3 A	Determine Fourier series for the $f(x) = x^2$ for $-\pi \leq x < \pi$	10	3	3	3
B	Determine the FT of $\cos(\omega_0 t)$. Plot the magnitude spectrum.	10	3	3	3
4	Derive LT of $u(t)$. Using LT properties, derive the Laplace transforms of	4	2	3	4
(i)	$x(t) = e^{-at} \cos(\omega_0 t) u(t)$. State the properties used.				
(ii)	Find initial and final values of the signal with transform given as	6	2	3	4
	$X(s) = \frac{2s + 6}{s(4s + 2)}$				
(iii)	A CT LTI system has system function as given. Determine $h(t)$ if system is known to be (i) Causal (ii) stable (iii) neither causal nor stable.	10	2	3	4
	$H(s) = \frac{s - 1}{(s - 2)(s + 1)}$				
5	$X(z) = \frac{1 + 2z^{-1}}{1 + 4z^{-1} + 3z^{-2}}; \text{ROC} \rightarrow z > 3$ Obtain IZT of $X(z)$ using (i) Inverse integral method (Cauchy's residue theorem) (ii) Partial fraction method (iii) Long division method Comment on the stability of the system.	15	2	3	
	A causal discrete-time LTI system is described by $y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n]$ where $x[n]$ and $y[n]$ are the input and output of the system, respectively. (a) Determine the system function $H(z)$. (b) Find the impulse response $h[n]$ of the system.	5	2	3	6
6A	For the difference equation given below: $y(n) = 2x(n) + x(n-1) + x(n-2) + x(n-3)$ Determine $H(z)$, $h(n)$. Is it FIR/IIR? Realize.	10	2	1	6
B	Explain the mapping between the s-plane and the z-plane.	10	2	1	6
7A	Realize filter with impulse response $h(n)$ given as $h(n) = 4\delta(n) + 5\delta(n-1) + 6\delta(n-2) + 7\delta(n-3)$. Calculate output $y(n)$ if input $x(n)$ is $x(n) = [1, 2, 3]$.	10	2	2	2,6
B	Realize $H(z)$ using parallel realization. $H(z) = \frac{3z(5z - 2)}{(z + \frac{1}{2})(3z - 1)}$	10	4	3	4



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END SEM/RE-EXAM EXAMINATION MAY/JUNE 2025

Program: M/E

S.Y. B.Tech (ETED) Sem IV

Duration: 3 hr

Course Code: MI-BT041

Maximum Points: 100

Course Name: Introduction to Robotics

Semester: IV

Instructions:

- Question 1 is compulsory.
- Illustrate your answers with neat sketches wherever necessary.
- Assume appropriate data if required and state your reason.
- Preferably, write the answers in sequential order.

26/5/25

Q.	Questions	Points	CO	BL	Module No.
Q.1	a. Using the three laws of robotics, create a scenario where a robot is involved in a real-world task, explaining how each law applies.	5	1	3	1
	b. A robotic arm is required to assemble small electronic components in a confined workspace. Suggest a suitable robotic system based on work volume and configuration. Justify your answer.	5	2	3	2
	c. Develop a sensor layout plan for an autonomous delivery robot. Include sensors for localization, obstacle detection, mapping. Justify your choices.	5	2,3	5,6	3
	d. Describe methods of robot programming and explain how they are applied in industrial environments.	5	4	2,3	6
Q.2	a. What is Gazebo? Why is it widely used in robotic simulation?	5	1	1	6
	b. Differentiate between industrial, non-industrial, and special-purpose robots with examples.	5	2	2	1
	c. Describe the motion subsystem and its components, including manipulators, joints, and end-effectors.	5	3	1	1
	d. Explain how the concept of Degrees of Freedom (DOF) influences the design and capabilities of robotic arms used in industrial automation.	5	4	3	1
Q.3	a. List and explain at least five industrial applications of robots. Highlight how automation improves productivity in these sectors.	5	1	2	2
	b. Explain the purpose of WAIT, SIGNAL, and DELAY commands in robotic programming.	5	2	3	6
	c. What is the function of the Remote Center Compliance (RCC) device in robotic assembly? Explain with an industrial scenario where misalignment is a frequent issue.	5	3	4	2
	d. Classify any three types of robots based on their drive mechanisms and explain their typical industrial applications.	5	4	3	2
Q.4	a. Define and explain the key characteristics of sensing devices: sensitivity, resolution, accuracy, and repeatability.	5	1	1	3



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	b. i. If the maximum count possible for an incremental rotary encoder is 6000 pulses and the encoder has a full-scale range of $\pm 270^\circ$, calculate the angular position corresponding to a count of $n = 1250$ pulses. ii. A linear potentiometer with a total length of 172 mm and a total resistance of 7 kΩ is used to measure the displacement of a robotic arm. The potentiometer is connected to a 12V reference voltage (V_R). If the wiper moves by 85 mm, determine: - The output voltage (V_0). - The resistance between the wiper and ground.	2+3	2		3
	c. How do control statements (IF, ELSE, WHILE, FOR loops) enhance robotic program execution? Explain with examples.	5	3		6
	d. Discuss the environmental factors that influence robot design and operation in industries such as space exploration, underwater environments, and hazardous areas.	5	4	5	3
Q.5	a. Define a robotic gripper and explain its significance in automation and manufacturing.	5	1	1	4
	b. Explain the working and applications of mechanical grippers. How do they differ from other types?	5	2	3	4
	c. Compare the advantages and limitations of two-finger, three-finger, and multi-finger grippers.	5	3	4	4
	d. Discuss the use of robotic grippers in food handling and packaging industries. What are the major design challenges?	5	4	3	4
Q.6	a. Define a control system in robotics. Why is it important?	5	1	1	5
	b. Explain the difference between open-loop and closed-loop control systems in robotics.	5	2	3	5
	c. Compare on-off control, proportional control, and PID control with application scenario.	5	3	4	5
	d. Suggest an appropriate transmission and drive system for a warehouse robot and justify your selection.	5	4	3	5
Q.7	a. Describe the evolution of programming languages used in robotics. How have they improved over time?	5	1	2	7
	b. Explain the structure of robot programming with labeled diagram.	5	2	3	7
	c. Compare first-generation, second-generation robotic languages with modern languages like ROS in terms of capabilities and ease of use.	5	3	4	7
	d. How have open-source frameworks changed the development of robotic programming languages?	5	4	2	7



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

Program: M/E

Course Code: MI-BT041

Course Name: Introduction to Robotics

Instructions:

Duration: 3 hr

Maximum Points: 100

Semester: IV

- Question 1 is compulsory.
- Illustrate your answers with neat sketches wherever necessary.
- Assume appropriate data if required and state your reason.
- Preferably, write the answers in sequential order.

30/6/25

Q. No.	Questions	Points	CO	BL	Module No.
Q.1	a. Explain Isaac Asimov's Three Laws of Robotics and their relevance in modern robotics. What is the fourth law of robotics introduced by Fuller in 1999? How does it impact employment?	5	1	3	1
	b. Differentiate between electric, hydraulic, and pneumatic drive systems. Suggest which is most suitable for heavy-duty welding and justify your choice.	5	2	3	2
	c. Identify and justify sensors needed for navigation, obstacle detection, and inventory recognition in an automated warehouse. Include placement and significance.	5	2,3	5,6	3
	d. Compare online and offline robot programming methods. For each, provide one industrial example and discuss its advantages and limitations.	5	4	2,3	6
Q.2	a. Define robot programming and explain its significance in robotic automation.	5	1	1	6
	b. Differentiate between planar DOF, spatial DOF, and redundant DOF. Provide examples.	5	2	3	1
	c. Describe the motion subsystem and its components, including manipulators, joints, and end-effectors.	5	3	1	1
	d. Explain how the concept of Degrees of Freedom (DOF) influences the design and capabilities of robotic arms used in industrial automation.	5	4	3	1
Q.3	a. List and explain at least five industrial applications of robots. Highlight how automation improves productivity in these sectors.	5	1	2	2
	b. Explain the purpose of WAIT, SIGNAL, and DELAY commands in robotic programming.	5	2	3	6
	c. What is a Remote Center Compliance (RCC) device? Discuss its role in assembly applications.	5	3	4	2
	d. Classify any three types of robots based on their drive mechanisms and explain their typical industrial applications.	5	4	3	2



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

Q.4	a. Define and explain the key characteristics of sensing devices: sensitivity, resolution, accuracy, and repeatability.	5	1	1	3
	b. i. If the maximum count possible for an incremental rotary encoder is 4000 pulses and the encoder has a full-scale range of $\pm 360^\circ$, calculate the angular position corresponding to a count of $n = 1430$ pulses. ii. A linear potentiometer with a total length of 160 mm and a total resistance of 7 k Ω is used to measure the displacement of a robotic arm. The potentiometer is connected to a 12V reference voltage. If the wiper moves by 90 mm, determine: 1. The output voltage at the wiper. 2. The resistance between the wiper and ground.	2+3	2		3
	c. How do control statements (IF, ELSE, WHILE, FOR loops) enhance robotic program execution? Explain with examples.	5	3		6
	d. Discuss the environmental factors that influence robot design and operation in industries such as space exploration, underwater environments, and hazardous areas.	5	4	5	3
Q.5	a. Define a robotic gripper and explain its significance in automation and manufacturing.	5	1	1	4
	b. i. A gripper is holding an object of weight 100 kg using a friction coefficient of 0.25. If the number of contact surfaces is 2, determine the required gripping force. ii. If a 200 kg object is to be lifted with an acceleration of 5 m/s ² , and the friction coefficient is 0.3 with 2 contact surfaces, calculate the gripping force required.	2+3	2	3	4
	c. Compare the advantages and limitations of two-finger, three-finger, and multi-finger grippers.	5	3	4	4
	d. Discuss the use of robotic grippers in food handling and packaging industries. What are the major design challenges?	5	4	3	4
Q.6	a. Define a drive system in robotics. Why is it essential for robot operation?	5	1	1	5
	b. Explain the difference between open-loop and closed-loop control systems in robotics.	5	2	3	5
	c. Compare on-off control, proportional control, and PID control with application scenario.	5	3	4	5
	d. Suggest an appropriate transmission and drive system for a warehouse robot and justify your selection.	5	4	3	5
Q.7	a. Explain the generations of programming languages with a focus on their application in robotics.	5	1	2	7
	b. Explain the structure of robot programming with labeled diagram.	5	2	3	7
	c. Compare first-generation, second-generation robotic languages with modern languages like ROS in terms of capabilities and ease of use.	5	3	4	7
	d. How have open-source frameworks changed the development of robotic programming languages?	5	4	2	7