Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

D.S.Y. B.Tech (electrical)

Sem IV

ENDSEM- REEXAMINATION JULY-2022

12/7/22

Program: ELECTRICAL

Duration: 03 Hours

Course Code: BS-BTE401

Maximum Points: 100

Course Name: APPLIED MATHEMATICS-IV

Semester: IV

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

QN O.	QUESTION	PO IN TS	CO	BL	PI
QI a)	If the mean of a binomial distribution is 3 and the variance is $\frac{3}{2}$, find the probability of obtaining atleast 4 success.	06	1	2	2.1.3
QI b)	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	06	3	3	1.1.1
QI c)	Verify whether the following functions can be looked upon as probability density function? $f(x) = \frac{1}{2}e^{-|x|}, -\infty \prec x \prec \infty$	08	1	1	1.1.2
QII a)	The diameters of can tops produced by a machine are normally distributed with standard deviation of 0.01 cms.At what mean diameter the machine be set that not more than 5% of the can tops produced by the machine have diameters exceeding 3 cms?	10	1	2	2.1.4
QII b)	A & B throw alternately a pair of dice whoever throw '9' first wins the game. If 'A' starts the game. What are their chances of winning?	10	2	2	2.3.1
QIII a)	Using Taylor's series method solve $\frac{dy}{dx} = 1 - 2xy$ given that y(0) = 0 and hence find y(0.2) and y (0.4)	06	1	2	1.1.2
QIII b)	The sales-data of an article in six shops before and after a special promotional campaign are as under	06	1	2	1.1.1

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ENDSEM- REEXAMINATION JULY-2022

Shops	A	B	C	D	E	F			
Before Campaign	53	28	31	48	50	42			
After Campaign	58	29	30	55	56	45			

	Can the campaign be judged to be a success at 5% LOS.				
QIII c)	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	08	1	1	2.1.4
QIV a)	A car – hire firm has two cars, which it hires out day by day. The number of demands for a cal on each day is distributed a Poisson distribution with mean 1.5. Calculate the proportion of days on which neither car is used and the proportion of days on which some demand is refused.	06	1	3	2.3.1
QIV b)	Five defective bulbs are accidently mixed with twenty good once. It is not possible to just look at the bulb and tell whether or not it is defective. Find the probability distribution of the number of defective bulbs, if four bulbs are drawn out at random from this lot.	06	2	2	1.1.3
QIV c)	Solve the following system by Gauss – Jacobi and method $10x - 5y - 2z = 3$; $4x - 10y + 3z = -3$; $x + 6y + 10z = -3$.	08	3	1	2.3.4
QV a)	Fit a binomial distribution for the following data and compare the theoretical frequencies with the actual ones:	06	1	1	2.3.1
QV b)	In an experiment on immunization of cattle from tuberculosis the following results were obtained.	06	1	2	1.1.1

QV a) table:

X	0	1	2	3	4	5
f	2	14	20	34	22	8

QV b) table:

	Affected	Not affected
Inoculated	267	27

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	Not Inoculated	757	155	862		
	Use Chi square test to determine the efficacy of vaccine in preventing tuberculosis.					
QV c)	Solve the following system of equations by Gauss – Seidel method correct to three decimal places: $$x + y + 54z = 110$$ $$27x + 6y - z = 85$$ $$6x + 15y + 2z = 72$$	08	3	2	2.3.4
QVI a)	Compute spearman's rank coorelation coefficient for the following data 	X	10	12	18	18	15	40	 	Y	12	18	25	25	50	25		06	2	1	1.1.3
QVI b)	A die is thrown 264 times with the following results No appeared on die: 1, 2, 3, 4, 5, 6 Frequency: 40, 32, 28, 50, 54, 60 Show that the die is biased	06	1	3	2.1.3
QVI c)	Using Runge-Kutta method {IV^{th} order} find the numerical solution at x = 0.6 for $\frac{dy}{dx} = \sqrt{x + y}$, given y(0.4) = 0.41 using h = 0.2.	08	3	1	1.1.1
QVII a)	Using Newton-Raphson method find the root of $x \log_{10} x = 12.34$ with $x_0 = 10$ upto 3 places of decimal.	06	3	3	2.1.4
QVII b)	Using Euler's method find the approximate value of y at x = 2 where $\frac{dy}{dx} = \frac{y - x}{x}$ and y(1) = 2 taking h = 0.2 and compare it with exact value.	06	2	2	1.1.3
QVIIc)	Solve by Gauss Elimination method $2x - y + 3z + w = 9, 3x + y - 4z + 3w = 3,$ $5x - 4y + 3z - 6w = 2, x - 2y - z + 2w = -2$	08	3	3	2.1.3

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Percentage Points of χ^2 - Distribution

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

Φ \ P	0 = .99	0.95	0.50	0.10	0.05	0.02	0.01
1	000157	.00393	.455	2.706	3.841	5.214	6.635
2	.0201	.103	1.386	4.605	5.991	7.824	9.210
3	.115	.352	2.366	6.251	7.815	9.837	11.341
4	.297	.711	3.357	7.779	9.488	11.668	13.277
5	.554	1.145	4.351	9.236	11.070	13.388	15.086
6	.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	5.229	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	34.382	37.652	41.566	44.314
26	12.198	15.379	25.336	35.363	38.885	41.856	45.842
27	12.879	16.151	26.336	36.741	40.113	44.140	46.963
28	13.565	16.928	27.336	37.916	41.337	45.419	48.278
29	14.256	17.708	28.336	39.087	42.557	46.693	49.588
30	14.953	18.493	29.336	40.256	43.773	47.962	50.892

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	4.303	6.965	9.925
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	3.106
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	2.080	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	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.325	2.576

Area Under Standard Normal Curve

The table gives the area under the standard normal curve from $z = 0$ to $z = z_1$ which is the probability that z will lie between $z = 0$ and $z = z_1$.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4238	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

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D.Y. A Tech (Elect) Sem IV 4/7/22

ENDSEM- EXAMINATION (DSY) JUNE-2022

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Maximum Points: 100

Course Name: APPLIED MATHEMATICS-IV

Semester: IV

- Attempt any five out of seven questions

- Use of scientific calculator is allowed.

QN O.	QUESTION	POINTS	CO	BL	PI
QI a)	Let X & Y be two independent binomial variates with parameters $(n_1=6, p=1/2)$ and $(n_2=4, p=1/2)$ respectively. Evaluate $P(X+Y)=3$.	06	1	2	2.1.3
QI b)	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	06	3	3	1.1.1
QI c)	Verify whether the following functions can be looked upon as probability density function? $f(x) = \frac{1}{2}e^{-|x|}, -\infty \prec x \prec \infty$	08	1	1	1.1.2
QII a)	The diameters of can tops produced by a machine are normally distributed with standard deviation of 0.01 cms. At what mean diameter the machine be set that not more than 5% of the can tops produced by the machine have diameters exceeding 3 cms?	10	1	2	2.1.4
QII b)	A & B throw alternately a pair of dice whoever throw '9' first wins the game. If 'A' starts the game. What are their chances of winning?	10	2	2	2.3.1
QIII a)	Two bad eggs are mixed accidently with 10 good ones. Find the probability distribution of the number of bad eggs in 3, drawn at random, without replacement from this lot.	06	1	2	1.1.2
QIII b)	The sales-data of an article in six shops before and after a special promotional campaign are as under	06	1	2	1.1.1

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ENDSEM- EXAMINATION (DSY) JUNE-2022

	Shops	A	B	C	D	E	F				
	Before Campaign	53	28	31	48	50	42				
	After Campaign	58	29	30	55	56	45				
	Can the campaign be judged to be a success at 5% LOS.										
QIII c)	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					08	1	1	2.1.4
QIV a)	A car – hire firm has two cars, which it hires out day by day. The number of demands for a cal on each day is distributed a Poisson distribution with mean 1.5. Calculate the proportion of days on which neither car is used and the proportion of days on which some demand is refused.					06	1	3	2.3.1
QIV b)	If $z = ax + by$ and 'r' is the correlation between x and y show that $$\sigma_z^2 = a^2\sigma_x^2 + b^2\sigma_y^2 + 2ab r \sigma_x\sigma_y$$ 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	1.1.3
QIV c)	Solve the following system by Gauss – Jacobi and method $10x - 5y - 2z = 3; 4x - 10y + 3z = -3; x + 6y + 10z = -3.$					08	3	1	2.3.4
QV a)	Fit a binomial distribution for the following data and compare the theoretical frequencies with the actual ones:					06	1	1	2.3.1
QV b)	In an experiment on immunization of cattle from tuberculosis the following results were obtained.					06	1	2	1.1.1

For QV a):

X	0	1	2	3	4	5
f	2	14	20	34	22	8

ENDSEM- EXAMINATION (DSY) JUNE-2022

			Affected	Not affected	Total			
		Inoculated	267	27	138			
		Not Inoculated	757	155	862			
	Use Chi square test to determine the efficacy of vaccine in preventing tuberculosis.							
QV c)	Solve the following system of equations by Gauss – Seidel method correct to three decimal places: $$x + y + 54z = 110$$ $$27x + 6y - z = 85$$ $$6x + 15y + 2z = 72$$				08	3	2	2.3.4
QVI a)	Compute spearman's rank coorelation coefficient for the following data 	X	10	12	18	18	15	40		Y	12	18	25	25	50	25		06	2	1	1.1.3
QVI b)	A die is thrown 264 times with the following results 	No appeared on die	1	2	3	4	5	6		Frequency	40	32	28	50	54	60	 Show that the die is biased					06	1	3	2.1.3
QVI c)	Using Runge-Kutta method {IVth order} find the numerical solution at $x = 0.6$ for $\dfrac{dy}{dx} = \sqrt{x + y}$, given $y(0.4) = 0.41$ using h = 0.2.				08	3	1	1.1.1
QVI I a)	Using Newton-Raphson method find the root of $x \log_{10} x = 12.34$ with $x_0 = 10$ upto 3 places of decimal.				10	3	3	2.1.4
QVI I b)	Solve by Gauss Elimination method $$2x - y + 3z + w = 9, \quad 3x + y - 4z + 3w = 3,$$ $$5x - 4y + 3z - 6w = 2, \quad x - 2y - z + 2w = -2$$				10	2	2	1.1.3

Percentage Points of t - distribution
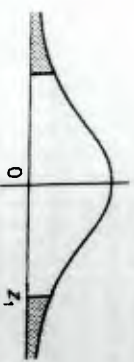
Example
For $\Phi = 10$ d.o.f.
$P(\,|t|\,>1.812\,)=0.1$

Φ \ P	0.20	0.10	0.05	0.02	0.01
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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	2.996	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	3.106
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	2.896
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
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29	1.311	1.699	2.046	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.356	2.617
∞	1.282	1.645	1.960	2.325	2.576

Percentage Points of χ^2 - Distribution

Example
For $\Phi = 10$ d.o.f.
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Φ \ P	0.99	0.95	0.50	0.10	0.05	0.02	0.01
1	.000157	.00393	.455	2.706	3.841	5.214	6.635
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3	.115	.352	2.366	6.251	7.815	9.837	11.341
4	.297	.711	3.357	7.779	9.488	11.668	13.277
5	.554	1.145	4.351	9.236	11.070	13.388	15.086
6	.872	1.635	5.348	10.645	12.592	15.033	16.812
7	1.239	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	22.616	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	5.229	7.261	14.339	22.307	24.996	28.259	30.578
16	5.812	7.962	15.336	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	13.846	23.337	33.196	36.415	40.270	42.980
25	11.524	14.611	24.337	34.382	37.652	41.566	44.314
26	12.198	15.379	25.336	35.363	38.885	41.856	45.642
27	12.878	16.151	26.336	36.741	40.113	44.140	46.963
28	13.565	16.928	27.336	37.916	41.337	45.419	48.278
29	14.256	17.708	28.336	39.087	42.557	46.693	49.588
30	14.953	18.493	29.336	40.256	43.773	47.962	50.892

Area Under Standard Normal Curve

The table gives the area under the standard normal curve from $z = 0$ to $z = z_1$ which is the probability that z will lie between $z = 0$ and $z = z_1$.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

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

27/5/22

ENDSEM- EXAMINATION MAY-2022

Program: ELECTRICAL

Course Code: BS-BTE401

Course Name: APPLIED MATHEMATICS-IV

Duration: 03 Hours

Maximum Points: 100

Semester: IV

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

QN O.	QUESTION	POINTS	CO	BL	PI
QI a)	The ratio of the probability of 3 successes in 5 independent trials to the probability of 2 successes in 5 independent trials is ¼. What is the probability of 4 successes in 6 independent trials?	06	1	2	2.1.3
QI b)	Use Taylor's series method to find y (1.1) given $\frac{dy}{dx} = xy^{1/3}$ y(1) = 1	06	3	3	1.1.1
QI c)	Given below is the probability distribution of a drv x with mean=16 then find 'a' & 'b' and variance of x	08	1	1	1.1.2
QII a)	If the actual amount of coffee which a filling machine puts into 6 ounce jars is a random variable having normal distribution with standard deviation 0.05 ounce and if only 3% of the jars are to contain less than 6 ounce of coffee what must be the mean fill of these jars?	10	1	2	2.1.4
QII b)	Solve, by Gauss – Seidel method, the following system: $28x + 4y - z = 32$ $x + 3y + 10z = 24$ upto 4 places of decimal. $2x + 17y + 4z = 35$	10	2	2	2.3.1
QIII a)	Five defective bulbs are accidently mixed with twenty good once. It is not possible to just look at the bulb and tell whether or not it is defective. Find the probability distribution of the number of defective bulbs, if four bulbs are drawn out at random from this lot.	06	1	2	1.1.2

Table for QI c):

x	8	12	16	20	24
P(x)	1/8	a	b	1/4	1/12

ENDSEM- EXAMINATION MAY-2022

QIII b)	The sales-data of an article in six shops before and after a special promotional campaign are as under	06	1	2	1.1.1

Shops	A	B	C	D	E	F
Before Campaign	53	28	31	48	50	42
After Campaign	58	29	30	55	56	45

Can the campaign be judged to be a success at 5% LOS.

QIII c)	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	08	1	1	2.1.4

QIV a)	Suppose that a local appliances shop has found from experience that the demand for tube lights roughly distributed as Poisson with a mean of 4 tubes per week. If the shop keeps 6 tubelights during a particular week. What is the probability that the demand will exceed the supply during that week?	06	1	3	2.3.1
QIV b)	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	2	2	1.1.3
QIV c)	Using Euler's method find the approximate value of y at $x = 2$ where $\dfrac{dy}{dx} = \dfrac{y-x}{x}$ and $y(1) = 2$ taking $h = 0.2$ and compare it with exact value.	08	3	1	2.3.4

QV a)	Fit a binomial distribution for the following data and compare the theoretical frequencies with the actual ones:	06	1	1	2.3.1

X	0	1	2	3	4	5
f	2	14	20	34	22	8

QV b)	Investigate the association between the darkness of eyecolour in father and son from the following data	06	1	2	1.1.1

Colour of father's eyes

ENDSEM- EXAMINATION MAY-2022

			Dark	Not Dark	Total		
		Dark(Son)	48	90	138		
		Not Dark(Son)	80	782	862		
		Total	128	872	1000		
QV c)		Solve the following system of equations by using Gauss – Jacobi method (correct to 3 decimal places) $8x - 3y + 2z = 20$ $4x + 11y - z = 33$ $6x + 3y + 12z = 35$	08	3	2	2.3.4
QVI a)		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	2	1	1.1.3
QVI b)		A die is thrown 264 times with the following results Show that the die is biased	06	1	3	2.1.3
QVI c)		Using Runge - Kutta method of fourth order, solve $\dfrac{dy}{dx} = \dfrac{y^2 - x^2}{y^2 + x^2}$ given y(0) = 1 at x = 0.2	08	3	1	1.1.1
QVII a)		Using Newton-Raphson method find the root of $x \log_{10} x = 12.34$ with $x_0 = 10$ upto 3 places of decimal.	10	3	3	2.1.4
QVII b)		Solve using Gauss-Elimination method $5x - 9y - 2z + 4w = 7, 3x + y + 4z + 11w = 2,$ $10x - 7y + 3z + 5w = 6, -6x + 8y - z - 4w = 5$	10	3	2	1.1.3

For QVI b), the embedded table:

No appeared on die	1	2	3	4	5	6
Frequency	40	32	28	50	54	60

3

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	4.303	6.965	9.925
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	3.106
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	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.325	2.576

Percentage Points of χ^2 - Distribution

Example

For $\Phi = 10$ d. o. f.

$P(\chi^2 > 15.99) = 0.10$

Φ \ P	0.99	0.95	0.50	0.10	0.05	0.02	0.01
1	.000157	.00393	.455	2.706	3.841	5.214	6.635
2	.0201	.103	1.386	4.605	5.991	7.824	9.210
3	.115	.352	2.366	6.251	7.815	9.837	11.341
4	.297	.711	3.357	7.779	9.488	11.668	13.277
5	.554	1.145	4.351	9.236	11.070	13.388	15.086
6	.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	5.229	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
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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	34.382	37.652	41.566	44.314
26	12.198	15.379	25.336	35.363	38.885	41.856	45.642
27	12.879	16.151	26.336	36.741	40.113	44.140	46.963
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29	14.256	17.708	28.336	39.087	42.557	46.693	49.588
30	14.953	18.493	29.336	40.256	43.773	47.962	50.892

Area Under Standard Normal Curve

The table gives the area under the standard normal curve from $z = 0$ to $z = z_1$ which is the probability that z will lie between $z = 0$ and $z = z_1$.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.8832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3886	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4415	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4841	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4560	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

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RE-EXAMINATION, JULY-2022

D. S. Y-B. Tech (Electrical) Term IV

14/7/22

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

Class: **Second Year B.Tech. (Electrical)**

Course code:**MC-BTE 002**

Name of the Course: **Indian Traditional Knowledge**

Date: **July 2022**

Duration: **3 Hr.**

Max. Points: **100**

Semester: **IV**

Instructions: Solve ANY FIVE Questions with elaborative answers in legible handwriting.

Q. No.	Question	Points	CO	BL	PI	Module
Q.1	a) **Explain:** *'Concept and Rule of Dharma in India since ancient times'* with suitable examples.	(10)	1	II	6.1.1	1
	b) **Justify:** *"India is the unique country with unity in diversity as its core strength since ancient times"* giving suitable examples.	(10)	1	VI	6.1.1	1
Q.2	a) **Discuss :** Spiritual enrichment of ancient Indian tradition with suitable examples.	(10)	1	I,VI	6.1.1	2
	b) **List:** Names of Principal Vedas and Upvedas. **Justify:** *"Vedas are the eternal source of knowledge for mankind since time in memory".*	(10)	1	I, VI	6.1.1	2
Q.3	a) **Explain:** With two examples the greatness of wisdom of ancient indian scholars in the field of mathematics and astronomy.	(10)	2	II	6.1.1	3
	b) **Discuss:** Advancement in the field of science and technology in ancient India.	(10)	2	V	6.1.1	3
Q.4	a) **Justify:** Advancements in medicinal and healthcare practices in ancient India.	(10)	2	VI	6.1.1	4
	b) **Justify:** *"Yoga is the key for long life with good health"* in context of ancient as well as modern India.	(10)	2	VI	6.1.1	4
Q.5	a) **List:** Names of various Indian classical dance forms and **Describe:** Any two of them with its significance.	(10)	3	I, V	6.1.1	5
	b) **List:** Various traditional art forms of ancient Indian and **Describe:** any one of them.	(10)	3	I, V	6.1.1	5
Q.6	a) **Explain:** Rich heritage of Indian Traditional Languages since ancient times and significance of any one language of India.	(10)	3	II	6.1.1	6
	b) **List: 03 Main epics / literature in Indian tradition. Discuss:** Significance and teachings of any one epic / literature.	(10)	3	V	6.1.1	6
Q.7	a) **Discuss:** In brief, life, work, philosophy and contribution of Sant Dnyaneshwar Maharaj.	(10)	4	V	6.1.1	7
	b) **Discuss:** In brief, life, work and teachings of Bhagwan Mahaveer Vardhaman.	(10)	4	V	6.1.1	7

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

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DSY END SEMESTER EXAMINATION, JULY-2022

D. S. Y. B. Tech (Etcd) Jem IV

Program: **B.Tech. in Electrical Engineering-DSY**   Date: **11 July 2022**

Class: **Second Year B.Tech. (Electrical)**   Duration: **3 Hr.**

Course code: **MC-BTE 002**   Max. Points: **100**

Name of the Course: **Indian Traditional Knowledge**   Semester: **IV**

Instructions: Solve ANY FIVE Questions with elaborative answers in legible handwriting.

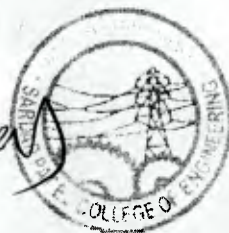| Q. No.	Question	Points	CO	BL	PI	Module
Q.1	a) **Explain:** *'Concept and Rule of Dharma in India since ancient times'* with suitable examples.	(10)	1	II	6.1.1	1
	b) **Justify:** *"India is the unique country with unity in diversity as its core strength since ancient times"* giving suitable examples.	(10)	1	VI	6.1.1	1
Q.2	a) **Discuss :** Spiritual enrichment of ancient Indian tradition with suitable examples.	(10)	1	I,VI	6.1.1	2
	b) **Justify:** *"Nature is the supreme teacher (Guru)"* with characteristics of any 03 elements in nature for learnings of Adi yogi Shri Dattatreya.	(10)	1	VI	6.1.1	2
Q.3	a) **Explain:** With two examples the greatness of wisdom of ancient indian scholars in the field of mathematics and astronomy.	(10)	2	II	6.1.1	3
	b) **Discuss:** Advancement in the field of science and technology in ancient India.	(10)	2	V	6.1.1	3
Q.4	a) **Justify:** Advancements in medicinal and healthcare practices in ancient India.	(10)	2	VI	6.1.1	4
	b) **Justify:** *"Yoga is the key for long life with good health"* in context of ancient as well as modern India.	(10)	2	VI	6.1.1	4
Q.5	a) **List:** Names of various Indian classical dance forms and **Describe:** Any two of them with its significance.	(10)	3	I, V	6.1.1	5
	b) **List:** Various traditional art forms of ancient Indian and **Describe:** any one of them.	(10)	3	I, V	6.1.1	5
Q.6	a) **Explain:** Rich heritage of Indian Traditional Languages since ancient times and significance of any one language of India.	(10)	3	II	6.1.1	6
	b) **Discuss:** Significance and teachings of any one great epic / literature of ancient Indian tradition.	(10)	3	V	6.1.1	6
Q.7	a) **Discuss:** In brief, life, work, philosophy and contribution of Sant Dnyaneshwar Maharaj.	(10)	4	V	6.1.1	7
	b) **Discuss:** In brief, life, work and contribution of Chhatrapati Shri Shivaji Maharaj.	(10)	4	V	6.1.1	7

Bharatiya Vidya Bhavan's

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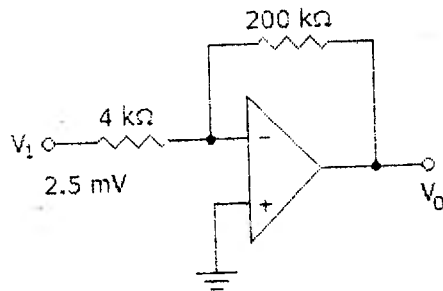
Munshi Nagar, Andheri (West), Mumbai – 400058

END SEMESTER EXAMINATION, MAY-2022

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

Class: **Second Year B.Tech. (Electrical)**

Course code:**MC-BTE 002**

Name of the Course: **Indian Traditional Knowledge**

Date:*17*May 2022

Duration: **3 Hr.**

Max. Points: **100**

Semester: **IV**

Instructions: Solve **ANY FIVE** Questions.

Q. No.	Question	Points	CO	BL	PI	Module
Q.1	a) **Explain:** *'Concept and Rule of Dharma in India since ancient times'* with suitable examples.	(10)	1	II	6.1.1	1
	b) **Justify:** *"India is the unique country with unity in diversity as its core strength since ancient times"* giving suitable examples.	(10)	1	VI	6.1.1	1
Q.2	a) **List:** Names of The Vedas and Upvedas. **Justify:**"*Vedas are the eternal source of knowledge for the entire mankid*".	(10)	1	I,VI	6.1.1	2
	b) **Justify:** *"Nature is the supreme teacher (Guru)"* describing characteristics of any 03 elements in nature, learnings of Adi yogi Shri Dattatreya from these elements of nature.	(10)	1	VI	6.1.1	2
Q.3	a) **Explain:** With two examples the greatness of wisdom of ancient indian scholars in the field of mathematics and astronomy.	(10)	2	II	6.1.1	3
	b) **Discuss:** Superior Knowledge of ancient Indian sages explaining the valuable contribution of Maharshi Kanad.	(10)	2	V	6.1.1	3
Q.4	a) **Explain:** Any one significant medical practice and medical practitioner in ancient India.	(10)	2	II	6.1.1	4
	b) **Justify:***"Yoga is the key for long life with good health"* in context of ancient as well as modern India.	(10)	2	VI	6.1.1	4
Q.5	a) **List:** Names of various Indian classical dance forms and **Describe:** Any two of them with its significance.	(10)	3	I, V	6.1.1	5
	b) **List:** Various traditional art forms of ancient Indian and **Describe:** any one of them.	(10)	3	I, V	6.1.1	5
Q.6	a) **Explain:** Rich heritage of Indian Traditional Languages since ancient times and significance of any one language of India.	(10)	3	II	6.1.1	6
	b) **Discuss:** Significance and teachings of any one great epic of ancient Indian tradition.	(10)	3	V	6.1.1	6
Q.7	a) **Discuss:** In brief, life, work, philosophy and contribution of Sant Dnyaneshwar Maharaj.	(10)	4	V	6.1.1	7
	b) **Discuss:** In brief, life, work, philosophy and teachings of Bhagwan Gautam Buddha for the entire mankind.	(10)	4	V	6.1.1	7

D. J. Y. B. Tech (Electrical)
Sem IV

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Munshi Nagar, Andheri (West), Mumbai – 400058

11/7/22

Re Exam July 2022

Solve any five questions out of seven.

Q. No.		Points	CO	BL	PI
1	State whether following statements are True/False. Justify your answer.				
A	Efficiency of class A power amplifier is the maximum compared to class B and C.	05	1	5	1.3.1
B	Higher the order of the filter, better is the filter.	05	5	5	1.3.1
C	Gain of BJT amplifier is less at higher frequencies compared to midband frequencies.	05	1	5	1.3.1
D	Oscillator circuit does not require any input signal.	05	5	5	1.3.1
2 A	With respect to power amplifier explain the following terms:	08	1	1	1.4.1
(i)	Conversion efficiency				
(ii)	Distortion				
(iii)	Heat sink				
(iv)	P_{dmax}				
B	Explain working of transformer coupled class B push pull power amplifier. What is crossover distortion? How is it eliminated?	12	1	1	1.4.1
3 A	Explain how the 555 is used as a astable multivibrator.	12	2	3	1.4.1
B	For an astable multivibrator, R_A = 2.2 KΩ, R_B = 6.8 KΩ, C = 0.01µF. Calculate T_{HIGH}, T_{LOW}, Frequency, Duty cycle.	08	2	3	1.4.1
4 A	Explain functional diagram of IC 723.	10	3	2	1.4.1
B	Explain the circuit to boost the current of IC 7805.	10	3	2	2.1.2
5 A	Discuss the reasons for difference in frequency response of BJT amplifier and opamp. Elaborate with suitable diagrams.	10	1	1	2.1.2
B (i)	Explain the term 'Miller capacitance' with respect to BJT amplifier	08	1	2	2.1.2

(ii) Determine the bandwidth of the amplifier shown below if UGB of opamp is 1 MHz

| | 02 | 1 | 3 | 2.1.2 |

| | | | 10 | 4 | 2 | 1.4.1 |

6 A   What are the advantages of negative feedback?

B   With the help of suitable block diagram explain the different types of negative feedback. For each type give feedback factor, input resistance, output resistance.

| | 10 | 4 | 2 | 1.4.1 |

7 A   Design first order Butterworth LPF at cutoff frequency 1kHz and passband gain of 2. Draw circuit diagram. Classify the filter designed as analog/digital, passive/active, audio/radio .Justify the answer.

| | 8 | 5 | 3 | 2.1.2 |

B (i)   Derive the formula for resonant frequency for Wien-bridge oscillator.

| | 8 | 5 | 3 | 2.1.2 |

(ii)   For the circuit of Wein Bridge Oscillator using opamp, the component values used are, R= 5.1 KΩ, C = 1nF, for the feedback network. R_1 = 5.1 KΩ and R_f = 12 KΩ for opamp. Draw circuit diagram. Determine whether the circuit will oscillate or not. If yes, obtain the output frequency.

| | 4 | 5 | 3 | 2.1.2 |

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Munshi Nagar, Andheri (West), Mumbai – 400058

D.S.Y. B. Tech sem IV (elect)

DSY End Sem July 2022

6/7/22

Program: Electrical Engineering

Course code: PC-BTE401
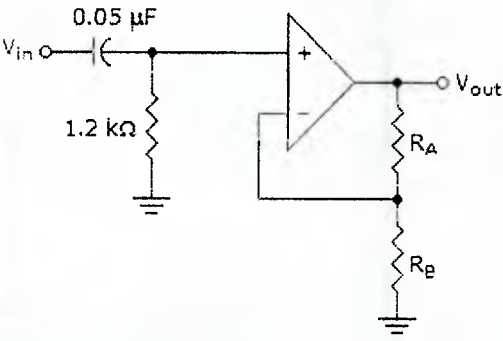
Name of the Course: Analog Circuits
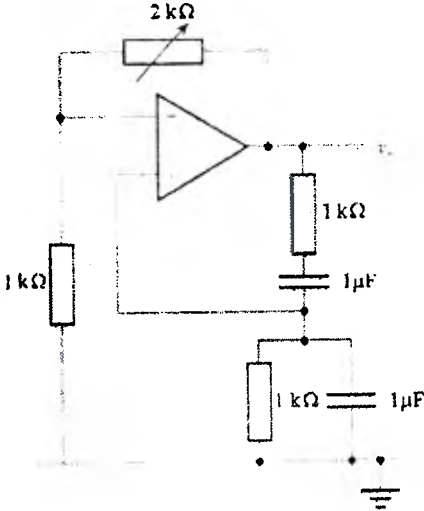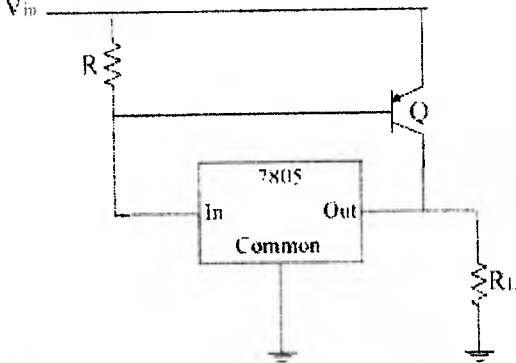
Duration: 3 Hour
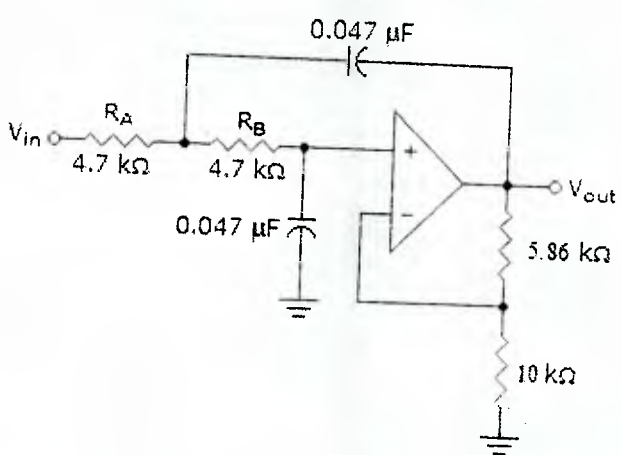
Maximum Marks: 100

Semester: IV

Solve any five questions out of seven.

Q.No.		Points	CO	BL	PI
1	State whether following statements are True/False. Justify your answer.		5	5	1.3.1
(i)	Oscillator circuit does not require any input signal.	5			
(ii)	Pulse Width Modulation circuit can be obtained using IC 555	5			
(iii)	Wien bridge oscillator uses positive as well as negative feedback.	5			
(iv)	Efficiency of linear regulators is less compared to switching regulators.	5			
2 (i)	What is meant by Roll Off rate? What is the roll off rate for the circuit shown below? Given R_A = 33KΩ and R_B = 10KΩ	2	5	3	1.6.1
(ii)	Determine the frequency of oscillation for the astable multivibrator using IC-555. Given that R_A = R_B = 1KΩ and C = 1000 pF.	2	2	3	1.3.1
(iii)	Voltage gain of an amplifier without feedback is 80dB. It decreases to 40dB with feedback. Calculate the feedback factor.	2	4	3	1.3.1
(iv)	Determine the feedback fraction if the voltage gain of an amplifier without feedback is 20 and with negative voltage feedback it is 12.	2	4	3	1.3.1
(v)	To generate a 1MHz signal, which is the most suitable circuit? Why?	2	5	2	1.4.1
(vi)	What do you mean by stop band with respect to active filter?	2	5	2	1.6.1
(vii)	Determine the bandwidth of the opamp if UGB is 1 MHz and the gain is 100dB	2	1	3	1.3.1

(viii)	Calculate the frequency of oscillation.	2	5	3	1.4.1

(ix)	Which type of power amplifier is biased for operation at less than $180°$ of the cycle? State the application.	2	1	1	1.3.1
(x)	A transformer-coupled, common emitter amplifier uses a 10:1 winding ratio. What is the load seen by the collector if the secondary drives 10 ohms?	2	1	3	1.3.1
3 A	What is the disadvantage of class B power amplifier? What is the need of class AB amplifier? Explain class AB with the help of proper diagrams.	8	1	2	1.3.1
B(i)	Differentiate between small signal amplifier and power amplifier	4	1	1	1.3.1
(ii)	Determine upper cutoff frequency for common emitter amplifier with potential divider bias with R_E bypassed, Given: $V_{cc} = 20V$, $C_{bc} = 36pF$, $C_{bc} = 4$ pF, $C_{cc} = 1$ pF, $C_{wi} = 6$ pF, $C_{wo} = 8$ pF, $h_{fe} = 100$, $h_{ie} = 1.32$ KΩ, $R_s = 1$ KΩ, $R_1 = 40$ KΩ, $R_2 = 10$ KΩ, $R_C = 4$ KΩ, $R_L = 2.2$ KΩ, $R_E = 2$ KΩ.	8	1	3	1.3.1
4A	With respect to the circuit diagram, Calculate output current coming from 7805 and coming from the transistor Q_1 for each load (i) 100 Ω (ii) 5 Ω (iii) 1 Ω. Given $V_{EB\,(ON)} = 1V$, $\beta = 15$, $R = 7\Omega$	8	3	3	1.3.1

B (i)	With the corresponding circuit diagram explain use of IC 723 to get output voltage of 5V for output current of 12 A.	06	3	3	1.4.1
(ii)	Which of the low-frequency cutoffs (lowest, middle or highest) determined by Cs, Cc, or CE will be the predominant in determining the low-frequency response for the complete system? Explain .	06	1	3	1.3.1
5A	Draw neat block diagram of 555 timer and hence explain the function of (i) discharge transistor (ii) comparators	10	2	1	1.3.1
B(i)	Draw a circuit diagram of monostable multivibrator using IC 555. Hence calculate the value of C with R = 120 kΩ and the time delay T = 1000 ms.	4	2	3	1.4.1
(ii)	Why opamp is considered as suitable amplifier at low frequency?	6	1	3	1.3.1
6A	Calculate component values needed for first order Butterworth LPF at cutoff frequency 3 kHz and passband gain of 3. Draw circuit diagram. Calculate Bandwidth. Classify the filter whether analog/digital, active/ passive.	10	5	3	1.6.1
B (i)	Identify the circuit. Determine cut off frequency.	4	5	5	1.4.1

0.047 µF

V_{in}

R_A 4.7 kΩ

R_B 4.7 kΩ

0.047 µF

V_{out}

5.86 kΩ

10 kΩ

(ii)	Draw a neat circuit diagram of RC phase shift oscillator using FET. State expression for frequency. Explain the role of feedback network.	6	5	1	1.3.1
7A	Justify the statement. 'Negative feedback is employed in the amplifiers in spite of reduction in gain'	4	5	4	1.6.1
B	With the help of suitable block diagrams explain the different types of negative feedback. For each type give feedback factor, input resistance, output resistance.	16	4	1	1.3.1

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S.Y. B. Tech (Elect.) Sem IV End Sem May 2022

Program: Electrical Engineering	**Duration: 3 Hour**
Course code: PC-BTE401	**Maximum Marks: 100**
Name of the Course: Analog Circuits	**Semester: IV**

Solve any five questions out of seven.

Q. No.		Points	CO	BL	PI
1	Explain with the help of proper circuit arrangements and waveforms applications of IC 555 as		2	2	1.6.1
A	PWM	10			
B	Schmitt trigger	10			
2 A	Explain the terms with respect to power amplifier.	4	1	2	1.4.1
(i)	(i) Power dissipation capability (ii) conversion efficiency				
(ii)	With the help of neat circuit diagram and characteristics, waveform with load line , show that maximum conversion efficiency of class A power amplifier with series fed load is 25%	6	1	2	1.4.1
B (i)	What is crossover distortion? How is it eliminated? Explain with the help of neat diagrams.	5	1	2	1.4.1
(ii)	A transformer coupled class A power amplifier is to be designed with following specifications. Output ac power 20 watts, load resistance 6Ω, D.C. supply voltage 18V. Efficiency of the transformer is 80%, . Is it possible to design the circuit using power transistor ECN149 [P_{Dmax} = 30 W, I_{Cmax} = 4A, V_{CEO} = 40 V] . Justify your answer on the basis of P_{Dmax}.	5	1	5	1.4.1
3 A	For common emitter amplifier with potential divider bias with R_E bypassed, the lower cutoff frequencies are given. The lower cutoff frequency due to C_s is 61.2 Hz. The lower cutoff frequency due to C_E is 337 Hz. The lower cutoff frequency due to C_C is 111 Hz. Also given: V_{cc} = 10V, C_{be} = 36pF, C_{bc} = 4 pF, C_{ce} = 1 pF, C_{wi} = 6 pF, C_{wo} = 8 pF, h_{fe}= 100, h_{ie} = 4.4 KΩ , R_s = 600Ω, R_1 = 18 KΩ, R_2 = 4.7 KΩ, R_C = 1.5 KΩ, R_L = 5 KΩ , R_E = 1.2 K Ω .	10	1	3	2.1.2

(i) Determine the value of C_s .
(ii) Determine the value of C_E .
(iii) Determine the value of C_C
(iv) Determine the net lower cutoff frequency. Explain with the help of frequency response.

B (i) 30 mV, 10 Hz signal is to be amplified to get output of 3.03 V. Draw the corresponding circuit selecting the proper components. Justify the selection. — 5 1 5 1.4.1

(ii) Explain Miller's theorem w.r.t. BJT — 5 1 2 1.4.1

4 A Refer to the fig. below. Explain role of transistor Q1 in the following circuit. — 5 3 3 1.4.1
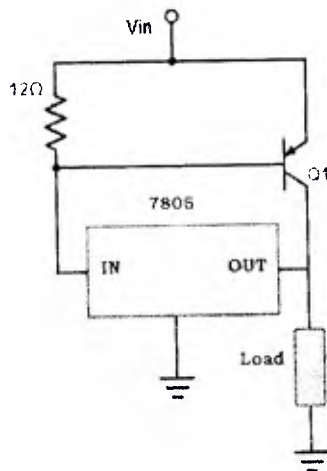
(ii) Explain use of 7805 to provide 7V. — 5 3 2 1.4.1

B What is current limit protection ? what is the arrangement for the same in IC 723? Explian constant current limiting . — 10 3 2 1.4.1

5 A State whether following statements are true or false. Justify your answer. — 4 5 1.4.1
(i) Voltage series feedback is most commonly used in cascaded amplifiers. — 5
(ii) Negative feedback provides stability of the gain. — 5

B
(i) The distortion in an amplifier with feedback is found to be 3%. The feedback factor is 0.04. When the feedback is removed, the distortion becomes 15%. Find the open and closed loop gain. — 3 4 3 1.4.1

(ii) Gain of the amplifier without feedback is 40. Bandwidth of the amplifier without feedback is 20kHz. Determine the bandwidth with negative feedback of 1 %. — 2 4 3 1.4.1

(iii) If the input to amplifier is 1V, output of an amplifier is 10 V and 100 mV from the output is fed back to the input. Determine value of feedback fraction β. — 2 4 3 1.4.1

(iv) Voltage gain of an amplifier without feedback is 60dB. It decreases to 40dB with feedback. Determine the value of feedback factor. — 3 4 3 1.4.1

6A
(i) Determine the type and order of filter used, if it is given that, the gain increases at the rate of 60dB/decade on the stop band. — 2 5 3 1.4.1
(ii) Higher the order of the filter better is the filter. Explain — 4 5 2 1.6.1
(iii) Draw the circuit of first order HPF along with frequency response. Hence explain the terms (i) Passband (ii) Stop band — 4 5 2 1.6.1

B
(i) Design the circuit of second order LPF with cut off frequency of 3kHz. Draw the circuit with the designed component values. — 5 5 5 1.6.1

5	5	4	1.6.1

(ii) (i) Gain (ii) easy to tune (iii) use of inductors (iv) isolation all are the advantages of an active filter. Is the statement correct? If not modify. Explain the same.

5	5	3	2.1.2

7A Identify the circuit. Explain. Determine frequency of oscillation.

(i)
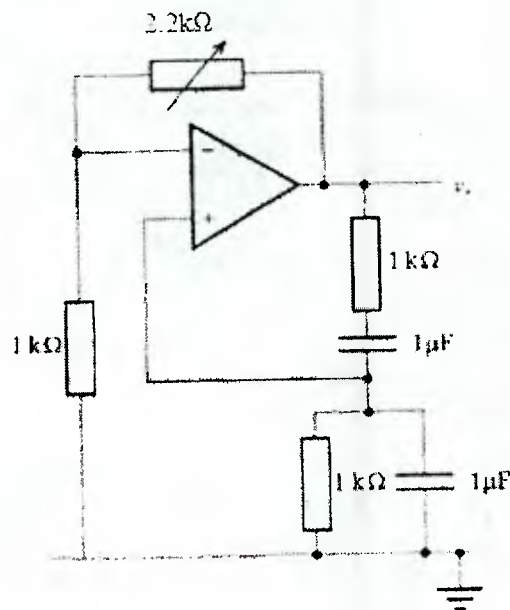
5	5	3	2.1.2
10	5	5	1.4.1

(ii) Explain why oscillator circuit does not require any input signal.

7 B In RC phase shift oscillator feedback circuit provides phase shift of 90^0. Is the statement correct? If not, modify. Explain with the help of corressponding circuit diagram.

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End Sem. Re-Examination – July 2022

D.J. Y. BTech (Electrical) Sem IV
13/7/22

Program: B.Tech. (Electrical)   Duration: 3 hrs.

Course Code: PC-BTE402   Maximum Points: 100

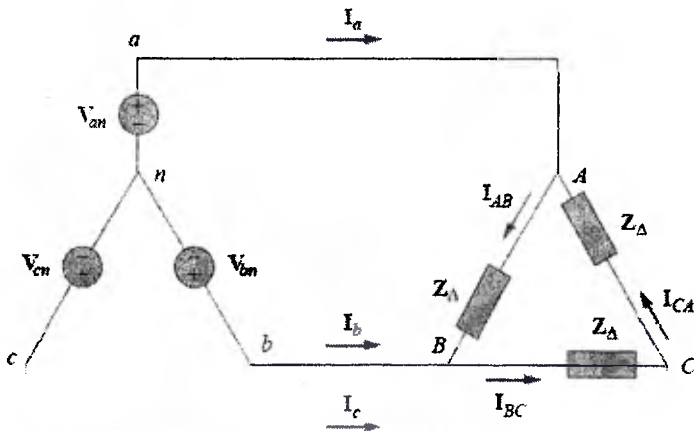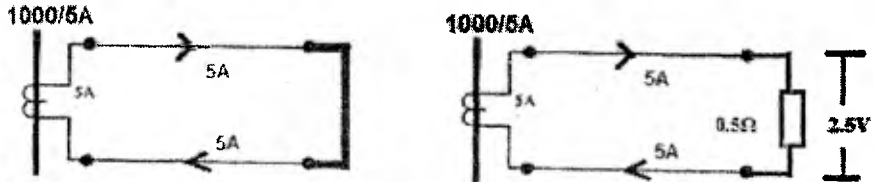**Course Name: Electrical and electronic measurement**   Semester: IV

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.

Q. No.	Questions	Pts.	CO	BL	PI
1. (a)	Draw the block diagram of a CRO and explain the different components in detail.	15	2	L2	2.1.2
(b)	For a particular measurement, the wattmeter readings were 5000 W and 1000 W. Calculate the power and power factor if one of the meters has to be reversed.	05	2	L3	2.4.2
2. (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	2.1.2
(b)	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	2.2.3
3. (a)	Describe with clear schematic diagram how high voltage, current and power are measured with the help of instrument transformers.	05	2	L1	2.1.2

(b)	Explain in detail a five point calibration method with flow chart.	05	2	L1	2.1.2
(c)	Explain the term 1. Sampling and holding 2. Quantizing and encoding	05	2	L2	2.1.2
(d)	With the help of neat diagram derive expression of shunt resistance (R_{sh}) used in Ammeter.	05	1	L2	2.2.3
4.(a)	With the help of neat block diagram explain in detail working of digital multi-meter.	10	1	L1	2.1.2
(b)	With the help of neat diagram explain in detail how to measure time interval between two events digitally?	10	1	L1	2.1.2
5. (a)	Explain with the help of a **neat diagram and expression** how to measure power in the following condition. 	10	3	L2	2.4.2
(b)	Draw and explain the operation of a meggar used for high resistance measurement.	10	1	L2	2.2.3
6. (a)	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	3	L3	2.4.2
(b)	Calculate CT burden in following conditions Fig. (a) Fig. (b)	05	2	L3	2.2.3

(c)	Explain in short eddy current damping system and derive the expression for damping torque of metal disc.	10	2	L2	2.1.2
7. (a)	With the help of neat diagram explain in details how to measure water level by using Capacitive method	10	2	L2	2.1.2
(b)	With the help of neat diagram explain in detail construction and working principle of photo multiplier.	10	2	L2	2.4.2

End Sem. Re-Examination – July 2022

D.J.Y, B.Tech (Electrical) sem IV 13/7/22

Program: B.Tech. (Electrical)	**Duration: 3 hrs.**
Course Code: PC-BTE402	**Maximum Points: 100**
Course Name: Electrical and electronic measurement	**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.

Q. No.	Questions	Pts.	CO	BL	PI
1. (a)	Draw the block diagram of a CRO and explain the different components in detail.	15	2	L2	2.1.2
(b)	For a particular measurement, the wattmeter readings were 5000 W and 1000 W. Calculate the power and power factor if one of the meters has to be reversed.	05	2	L3	2.4.2
2. (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	2.1.2
(b)	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	2.2.3
3. (a)	Describe with clear schematic diagram how high voltage, current and power are measured with the help of instrument transformers.	05	2	L1	2.1.2

(b)	Explain in detail a five point calibration method with flow chart.	05	2	L1	2.1.2
(c)	Explain the term 1. Sampling and holding 2. Quantizing and encoding	05	2	L2	2.1.2
(d)	With the help of neat diagram derive expression of shunt resistance (R_{sh}) used in Ammeter.	05	1	L2	2.2.3
4.(a)	With the help of neat block diagram explain in detail working of digital multi-meter.	10	1	L1	2.1.2
(b)	With the help of neat diagram explain in detail how to measure time interval between two events digitally?	10	1	L1	2.1.2
5. (a)	Explain with the help of a **neat diagram and expression** how to measure power in the following condition. 	10	3	L2	2.4.2
(b)	Draw and explain the operation of a meggar used for high resistance measurement.	10	1	L2	2.2.3
6. (a)	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	3	L3	2.4.2
(b)	Calculate CT burden in following conditions Fig. (a) Fig. (b)	05	2	L3	2.2.3

(c)	Explain in short eddy current damping system and derive the expression for damping torque of metal disc.	10	2	L2	2.1.2
7. (a)	With the help of neat diagram explain in details how to measure water level by using Capacitive method	10	2	L2	2.1.2
(b)	With the help of neat diagram explain in detail construction and working principle of photo multiplier.	10	2	L2	2.4.2

End Sem. Examination - June 2022 (DSY)

D. S. Y. B. Tech (Elect) Sem IV 8/2/22

Program: B. Tech. (Electrical)

Course Code: PC-BTE402

Course Name: Electrical and electronic measurement

Duration: 3 hrs.

Maximum Points: 100

Semester: IV

Notes:

1. All questions are compulsory.
2. Draw neat diagrams.
3. Assume suitable data if necessary.

Q. No	Questions	Pts.	CO	BL	PI
1. (a)	The four arms of a Maxwell's inductance–capacitance bridge at balance are Arm AB: A choke coil L1 with an equivalent series resistance R1 Arm BC: A non-inductive resistance of 800 Ω Arm CD: A mica capacitor of 0.3 μF in parallel with a non-inductive resistance of 800 Ω Arm DA : A non-inductive resistance 800Ω Supply is given between terminals A and C and the detector is connected between nodes B and D. Derive the equations for balance of the bridge and hence determine values of L1 and R1. Draw the phasor diagram of the bridge under balanced condition.	15	2	L3	2.4.2
(b)	For a particular measurement, the wattmeter readings were 5000 W and 1000 W. Calculate the power and power factor if one of the meters has to be reversed.	05	2	L3	2.4.2
2. (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	2.1.2

(b)	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	2.2.3
3. (a)	Compare between digital storage oscilloscope and cathode ray oscilloscope	05	2	L1	2.1.2
(b)	Explain in detail a five point calibration method with flow chart.	05	2	L1	2.1.2
(c)	Explain the term 1. Sampling and holding 2. Quantizing and encoding	05	2	L2	2.1.2
(d)	With the help of neat diagram derive expression of shunt resistance (R_{sh}) used in Ammeter.	05	1	L2	2.2.3
4.(a)	With the help of neat block diagram explain in detail working of digital multi-meter.	10	1	L1	2.1.2
(b)	With the help of neat diagram explain in detail how to measure time interval between two events digitally?	10	1	L1	2.1.2
5. (a)	The magnetizing current of a ring core current transformer of ratio 1000/5 A , when operating at full primary current and with a secondary burden of non-inductive resistance of 1 Ω is 1 A at a power factor of 0.4 Calculate: (i) The phase displacement between primary and secondary current. (ii) The ratio error at full load, assuming that there has been no compensation	10	3	L2	2.4.2
(b)	Draw and explain the operation of a meggar used for high resistance measurement.	10	1	L2	2.2.3
6. (a)	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	3	L3	2.4.2
(b)	Prove that $$G_f = 1 + 2v + \dfrac{\Delta \rho / \rho}{\varepsilon}$$	15	2	L3	2.2.
7. (a)	With the help of neat diagram explain in details how to measure water level by using Capacitive method	10	2	L2	2.1.2
(b)	The deflecting torque of an ammeter varies as the square of the current passing through it. If a current of 5 A produces a deflection of 90°, what deflection will occur for a current of 3 A when the instrument is : (i) Spring controlled (ii) Gravity controlled.	10	3	L3	2.4.2

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End Sem. Examination - May 2022

S.M. BTech (EL-CS) Sem IV

Program: B. Tech. (Electrical)　　　　　　　　　**Duration: 3 hrs.**

Course Code: PC-BTE402　　　　　　　　　　　**Maximum Points: 100**
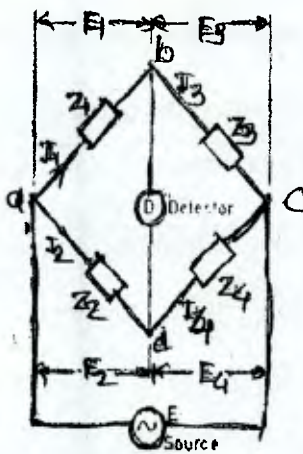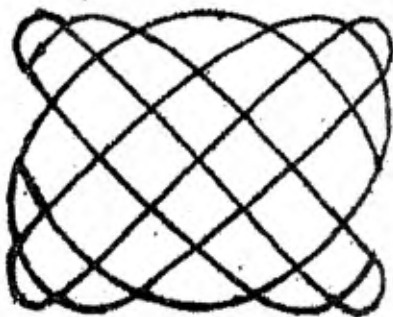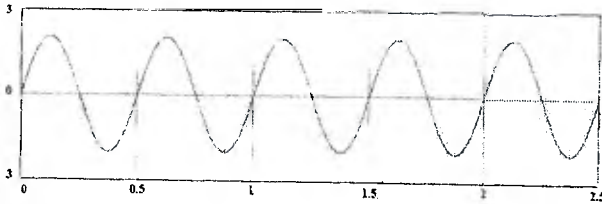
Course Name: Electrical and electronic measurement　　　**Semester: IV**

Notes:

Que. no.1 is
1. ~~All questions are~~ compulsory.
2. Draw neat diagrams.
3. Assume suitable data if necessary.

4. Attempt any four questions from the remaining six question.

Q. No.	Questions	Pts.	CO	BL	PI
1. (a)	An a.c. bridge circuit working at 1000 Hz is shown in Fig.1. Arm ab is a 0·2 µF pure capacitance; arm be is a 500 Ω pure resistance; arm cd contains .an unknown impedance and arm da has a 300 Ω resistance in parallel with a 0·1 µF capacitor. Find the R and L constants of arm cd considering it as a series circuit. Fig. 1 Basic AC bridge network	10	2	L3	2.4.2
(b)	The magnetizing current of a ring core current transformer of ratio 1000/5 A , when operating at full primary current and with a secondary burden of non-inductive resistance of 1 Ω is 1 A at a power factor of 0.4 Calculate: (i) The phase displacement between primary and secondary current. (ii) The ratio error at full load, assuming that there has been no compensation	10	2	L3	2.4.2

2. (a)	Find the frequency of the vertical plates if the frequency applied to horizontal plate is 50 Hz for the pattern shown in figure (a) and (b).	05	1	L2	2.1.2

(a)   (b)

2. (b)	With the help of neat diagram explain in details construction and working principal of quality factor meter.	10	1	L1	2.1.2
2. (c)	How to measure time interval between two events using flip flop circuit.	05	1	L1	2.2.3
3. (a)	Compare between digital storage oscilloscope and cathode ray oscilloscope	05	2	L1	2.1.2
(b)	Explain in detail a five point calibration method with flow chart.	05	2	L1	2.1.2
(c)	What is function of integrator in duel slope integrating type voltmeter	05	2	L2	
(d)	With the help of neat diagram derive expression of shunt resistance (R_{sh}) used in Ammeter.	05	1	L2	2.2.3
4.(a)	Draw the block diagram of a CRO and explain the different components in detail.	15	1	L1	2
(b)	Explain the term 1. Sampling and holding 2. Quantizing and encoding	05	1	L1	2.1.2
5. (a)	With the help of neat diagram explain in detail how to measure frequency of given signal using digital frequency meter?	10	3	L2	2.4.2

Time in second

(b)	Draw null and extreme positions of LVDT transducer to get zero, minimum and maximum output voltage.	10	1	L2	2.2.3
6. (a)	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	2.4.2
(b)	Prove that $$G_f = 1 + 2v + \frac{\Delta\rho/\rho}{\varepsilon}$$	15	2	L3	2.2.3
7.	With the help of neat diagram explain in details how to measure water level by using following methods. a. Resistive method b. Inductive method c. Capacitive method	20	2	L2	2.1.2

Re-exam and Previous Semester Examination July 2022

Program: DSY BTech

Course Code: PC-BTE403

Course Name: Signals and Systems

Duration: 3 Hr

Maximum Points:100

Semester:IV

Note:
- Attempt any FIVE question out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- In the absence of any data, make suitable assumptions and justify the same.

Q. No.	Questions	Points	CO	BL	Module No.
1a	Classify system y[n] =n x[n] as static/dynamic, linear/non-linear, time-variant/invariant, causal/non-causal and stable/unstable.	05			01
1b	Consider a signal $x(n) = (5)^n u(n)$. Test if the signal is i) energy or power signal. ii) Causal and non-causal signal	05			01
1c	Determine odd and even parts of signal x[n] = {4 ,1 ,-2 ,1 ,5}.	05			01
1d	Determine output of following system if $x[n] = u[n+2] - u[n-2]$ and $h[n] = 4\delta[n] + 5\delta[n-2] + 8\delta[n+2]$	05			02
2a	In an electrical network the relation between input voltage x(t) and output voltage y(t) is given by $\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y(t) = x(t)$ where $x(t) = e^{-7t} u(t)$. Use Laplace Transform to determine the output voltage y(t) if initial conditions in the network are y(0)= -1 and $\dot{y}(0) = 1$.	10			04
2b	State and prove any two properties of Laplace transform	05			04
2c	Consider a LTI system with transfer function $H(s) = \frac{s+2}{(s+5)(s+7)}$. Determine its impulse response. Is the system stable?	05			04
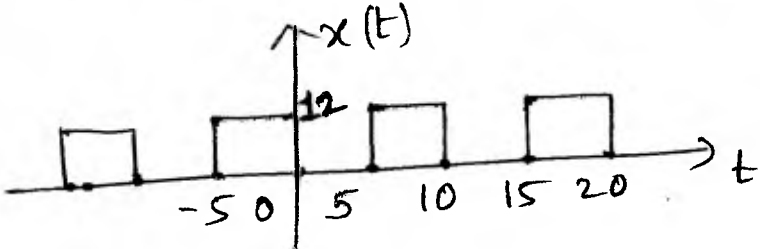
3a	Calculate the value of $(1/4)^n$ u[n] * $(1/7)^n$ u[n] using continuous time linear convolution. (use Graphical method)	10			02

3b	Consider a system described by a difference equation
	
	y[n] + (1/5) y[n-1] =2 x[n].
	
	   i) Determine Impulse response of the system
	   ii) Determine output of the system when input
	          x(n) = (0.5) ^{n} u(n) with initial output of the system
	          y(-1) = 1.
	
	(Use time domain method)
		10			02

4a	Realize given CT system in series and parallel form $$H(s) = \frac{s-5}{(s-2)(s-4)(s-6)}$$	10			07
4b	Obtain Direct form I and Direct form II realization of a system with transfer function $H(z) = \frac{5z^2 - 12z + 7}{9z^3 - z^2 + 2z - 5}$.	10			07
5a	Determine complex exponential Fourier series representation of following signal and magnitude of fundamental component 	08			03

5b	Consider a LTI system represented by
	
	$$\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 4y(t) = x(t)$$
	
	   i) Determine its impulse response.
	   ii) Determine output when input x (t) = e $^{-4t}$ u (t)
	   iii) Plot the frequency response of the system
	
	Use Fourier Transform only.
		12			03

Re-exam and Previous Semester Examination July 2022

6a	Determine Inverse ZT of $X(z) = \dfrac{z}{(z-3)(z-1)}$ using long division method if ROC is i) $|z| < 3$ ii) $|z| > 3$	10			05
6b	Determine ZT and ROC of following signals $\quad\quad\quad i) \; x[n] = 2^n u[n] + 3^n u[-n-1]$ ii) $x[n] = e^{\pm j\alpha n} u[n]$	10			05
7a	The output of the system $y[n] = (\frac{1}{5})^n u[n]$ when input applied is $x[n] = (\frac{1}{2})^n \; u[n]$. i) Determine impulse response of the system. ii) Draw pole-zero plot of the system and comment on the stability iii) Determine the output when input is changed to $x[n] = (\frac{1}{4})^n u[n]$.	10			06
7b	Determine initial and final value of x[n] if $X(z) = \dfrac{z(z-5)(z-3)}{(z-2)(z-3)(z-1)}$	05			06
7c	If x(t)=u(t), plot x(t+1)+x(t-1) .	05			01

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D.J.Y, B.Tech (Btech) Sem IV
11/7/22

DSYEnd Semester Examination July 2022

Program: DSY BTech	**Duration: 3 Hr**
Course Code: PC-BTE403	**Maximum Points:100**
Course Name:Signals and Systems	**Semester:IV**

Note:

- Attempt any FIVE question out of SEVEN questions
- Answers to all sub questions should be grouped together
- In the absence of any data, make suitable assumptions and justify the same.

Q. No.	Questions	Points	CO	BL	Module No.
1a	State and prove initial and final value theorem for continuous time systems. Calculate initial and final value of $Y(s) = \frac{4s+2}{s^2+4s+10}$	08			04
1b	In an electrical network the relation between input voltage x(t) and output voltage y(t) is given by $4\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + y(t) = x(t)$ where $x(t) = e^{-2t}$ u(t). Use Laplace Transform to determine the output voltage y(t) if initial conditions in the network are y(0)= -1 and $\dot{y}(0) = 1$.	12			04
2a	Calculate energy and power of signal $x(n) = (-2.5)^n$ u(n). Classify it as energy or power signal.	05			01
2b	Classify the system **y[n] = x[-n+10]** as static/dynamic, linear/non-linear, causal/non-causal and stable/unstable.	05			01
2c	Determine output of following system if $x[n] = u[n+2] - u[n-2]$ and $h[n] = \{5,6,7,10\}$ ↑	05			02
2d	Test if the signal x(t) = cos (2 t)+ 4sin(4t) is periodic? If periodic determine fundamental time period.	05			01
3a	Calculate the value of $(1/2)^n$ u[n] * u[n] using continuous time linear convolution. (Graphical method)	08			02

3b	Consider a system described by a difference equation
	
	y[n] = 2 y[n-1] +10 x[n].
	
	  i) Determine impulse response of the system.
	  ii) Determine output of the system when input
	       $x(n) = (0.5)^n\,u(n)$ with initial output of the system
	       y(-1) = 10.
	
	(Use time domain method)
		12			

4a	Realize given DT system in series and parallel form $$H(z) = \frac{z-5}{(z-2)(z-3)(z-1)}$$	10			7
4b	Obtain Direct form I and Direct form II realization of a system having transfer function $H(s) = \frac{2s^2+12\,s+17}{4s^3+s^2+2\,s-5}$.	10			7
5a	State and prove any two properties of Fourier Transform.	05			3
5b	Consider a LTI system with transfer function $H(jw) = \frac{j\omega+2}{(j\omega+5)(j\omega+7)}$. Determine its impulse response. When input applied is $x(t) = e^{-4t}\,u(t)$, determine output y (t). (Use Fourier Transform)	10			3
5c	Plot frequency spectrum of a signal x(t)= 4cos(5t)+2sin(5t)-2cos(10t)+7sin(15t)	05			3
6a	Determine Inverse ZT of $X(z) = \frac{z}{z-0.3}$ using long division method if ROC is i) |z|<0.3 ii) |z|>0.3	08			05

6b	Determine ZT of following signal
	  i) $\cos(\omega_0 n)\,u[n] + \sin(2\omega_0 n)\,u[n]$
	  ii) $[n+ n^2]u(n)$.
	  iii) $(\frac{1}{2})^n\,u[n] * (\frac{1}{4})^n\,u[-n-1]$
	Specify ROC for each of them. (Note : * is convolution operator)
		12			05

7a	The output of the system $y[n] = 2(\frac{1}{2})^n\,u[n]$ when input applied is
	$x[n] = u[n]$.
	  i) Determine impulse response of the system.
	  ii) Draw pole-zero plot of the system and comment on the stability
		10			06

	iii)	Determine the output when input is changed to $x[n] = \left(\frac{1}{4}\right)^n u[n]$.				
7b		Determine x[n] if $X(z) = \dfrac{z(z-5)}{(z-2)(z-3)(z-1)}$. Determine initial and final value of x[n].	10			06

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End Semester Exam

May 2022

Max. Marks: 100   Duration:3 Hr

Class: SY B.Tech   Semester: IV   Program: Electrical
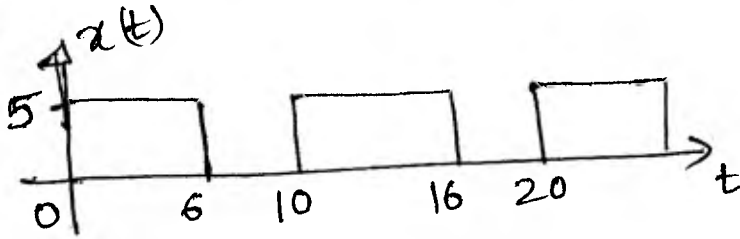
Name of the Course: **Signals and Systems**   Course Code : PC-BTE403

Instructions:

- Figures to the right indicate full marks
- In the absence of any data, make suitable assumptions and justify the same.

Q. No	Question	Max. Marks	CO	BL
Q1a	Consider a signal defined as $x(t) = \begin{cases} e^{j10t} & for\ |t| \leq 1 \\ 0 & for\ |t| > 1 \end{cases}$. Determine its Fourier Transform and plot frequency spectrum of the signal.	10	02	02
Q1b	Consider a signal $x(t) = e^{-5t}u(t) + e^{2t}u(-t)$. Determine the Laplace transform of x(t) and Draw ROC.	05	04	02
Q1c	Plot unit step response of a system whose transfer function $G(s) = \frac{1-2s}{s+1}$. Comment on the stability of the system.	05	04	03
Q2a	Consider a signal $x[n] = \left(\frac{1}{2}\right)^n u[n] + sin\left(\frac{\pi}{4}n\right)u[n]$. Determine the Z- transform of x[n] and Draw ROC.	05	05	02
Q2b	Test if a system described by input – output relation, y(t) = |x(t)| is linear, static and time varying ?Justify your answer.	05	01	02
Q2c	Consider a signal defined as $x(t) = \sin(wo\ t)\,u(t)$. Determine its Fourier Transform.	05	03	03
Q2d	Determine if the signal cos $(\frac{\pi}{5}$ n) is periodic? If yes determine its fundamental time period.	05	01	02
Q3a	Determine convolution x1*x2 if i) x1(t) = e $^{-2t}$ u(t) and x2(t) = u(t)	10	01	02

		10	04	03
	ii) x1[n] ={ 2 , 5, 7, 8, -1} and x2[n]= {-3, 0, 4,9}			
Q3b	In a mechanical system the relation between input x(t) and output y(t) is given by $\ddot{y}(t) + 7\,\dot{y}(t) + 10y(t) = 4x(t) + 5\dot{x}(t)$ where $x(t) = e^{-2t}\,u(t)$, Determine impulse response and output of the system.	10	04	03
Q4a	Find the exponential Fourier Series representation of $x(t) = 3 + \sin\left(3t + \frac{\pi}{4}\right) + \sin\left(9t + \frac{\pi}{3}\right)$. Plot the magnitude and phase spectrum of the signal x(t).	05	03	03
Q4b	Determine trigonometric Fourier series of following signal	05	03	03
Q4c	Determine inverse Z- Transform of $$X(z) = \frac{z^2 + z}{(z-1)(z+0.5)}$$ If ROC is i) |z|>1 ii) |z|<0.5 iii) 0.5<|z|<1	10	05	02
Q5a	Obtain Direct form I and II realization of a system with transfer function $H(z) = \frac{z^2+22\,z+18}{z^3+7z^2+2\,z-15}$	10	05	03
Q5b	Obtain Series and Parallel realization of a CT system having transfer function $H(s) = \frac{2\,s+10}{s^2+9\,s+14}$	10	04	03
Q6a	A causal, linear time-invariant (LTI) system is described by input – output relation y[n] +0.4 y[n-1] – 0.21 y[n-2] = x[n-1]. i) Calculate Transfer function of the system. ii) Draw pole-zero plot of the system. iii) Is the system bounded-input bounded-output (BIBO) stable? Justify your answer. iv) Calculate impulse response of the system v) Calculate output of the system if input applied is $(0.2)^n\,u[n]$.	10	05	04
Q6b	Plot following signals if x(t) = 4u(t) – 4 u(t-4). i) x(-t+3) iii) x(2t) ii) x(t+2)	10	01	02

	Also plot even and odd part of x(t).			
Q7a	The z – transform of a signal is given by $$C(z) = \frac{1}{4}\frac{z^{-1}(1 - z^{-4})}{(1 - z^{-1})^2}$$ Determine its initial and final value.	05	05	03
Q7b	Obtain output of a system using graphical method. The input applied to the system is $x[n] = \beta^n u[n]$ and impulse response is $h[n] = \alpha^n\, u[n]$. Assume β,α >0. When β=α, what is the value of the output. Verify the result using Z Transform.	10	01, 05	03
Q7c	Consider a causal system whose transfer function is given by $H(z) = \frac{5}{z-1}$. Determine impulse response of the system using long division method. (Determine at-least 4 samples).	05	05	02

D. S. 4. B, Tim Circuit Sem IV

Program: Electrical Engineering

Course code: PC-BTE404

Name of the Course: Microprocessor and Microcontroller

Duration: 3 Hours

Max. Marks: 100

Sem. IV

15/7/22

- 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.			Points	CO	BL	PI
1		State whether following statements are True/False. Justify the same.	20	1,2	5	1.4.1
i		After executing the instruction MOV A, 43H the accumulator contents are 43H.				
ii		8031 is called ROMless 8051.				
iii		WR is used to get the converted data out of the ADC0804 chip				
iv		The instruction "SETB P2.1" makes all pins of P2 high.				
v		A microcontroller is called a computer on a chip.				
2		What is the result after executing following? Explain	20	1	1	1.3.1
i		MOV A, #35H ANL A, #0FH				
ii		MOV A, # 04H ORL A, # 68H				
iii		MOV B , #94H MOV A , #79H XRL 0F0H, A				
iv		MOV A , #39H CPL A				
v		MOV A , #66H RR A				
3A i		A program to generate a square waves, of 50 Hz frequency on P1.2 using interrupts is to be written. Assume XTAL = 11.0592 MHZ. The timer 0 is to be used in mode 1. Explain the initialization required. i.e. determine the values to be loaded in (i) timer registers (ii) Interrupt register	8	1	3	1.4.1
ii		Explain what is represented by the following instructions. Specify its significance. **MOV IE, #10000010B**	2	1	2	1.6.1
B i		Write a program to take data from P1 and send it to P2 continuously. Explain	4	1	3	1.3.1
ii		Draw the interfacing diagram with LCD and 8051, in which Port 1 is used to connect data bus of 8051. P 2.0, P 2.1 and P2.2 are to be connected to RS, R/$\overline{W}$, E respectively. With respect to the diagram explain the following code.	6	2	3	1.4.1

```
MOV P1, A
SETB P2.0
CLR  P2.1
SETB P2.2
ACALL DELAY
CLR  P2.2
RET
```

4A	Describe the internal architecture of 8051 microcontroller with neat diagram.	10	1	3	1.4.1
B	With the help of neat diagram explain RAM allocation in 8051. Hence explain Register banks, stack, bit addressable RAM, scratch pad RAM.	10	2	2	1.3.1
5 A	Show the status of the carry, auxiliary carry and parity flag after executing following instructions	6	1	2	1.6.1
i	**MOV A, #9DH** **ADD A, #54H**				
ii	Draw the diagram showing the PSW register. Hence select bank 2.	4	1	2	1.6.1
B	Explain registers TMOD, SCON, SBUF. A program to receive data at a baud rate of 4800 is to be written using timer 1 in mode 2. Explain initialization required i.e. values to be stored in TMOD, SCON, TH1	10	1	3	1.4.1
6 A	Explain with suitable diagram, interfacing of 4x4 matrix keyboard with 8051. Explain the method to detect key press.	10	2	2	1.3.1
B	Explain the connection between 8051 and DAC0808 with the help of a neat interfacing diagram. Write a program to generate saw tooth waveform.	10	2	2	1.3.1
7A i	Draw control word format of 8255. Hence find the control word of the 8255 for all the ports A, B, and C as output ports (mode 0).	4	2	3	1.4.1
ii	Stepper motor is connected to 8051 using port A of 8255. Determine the control word required. Explain the same. How is it moved to the control register?	6	2	3	1.4.1
B	Determine the address space allocated to data RAM in figure shown below.	10	3	3	1.3.1
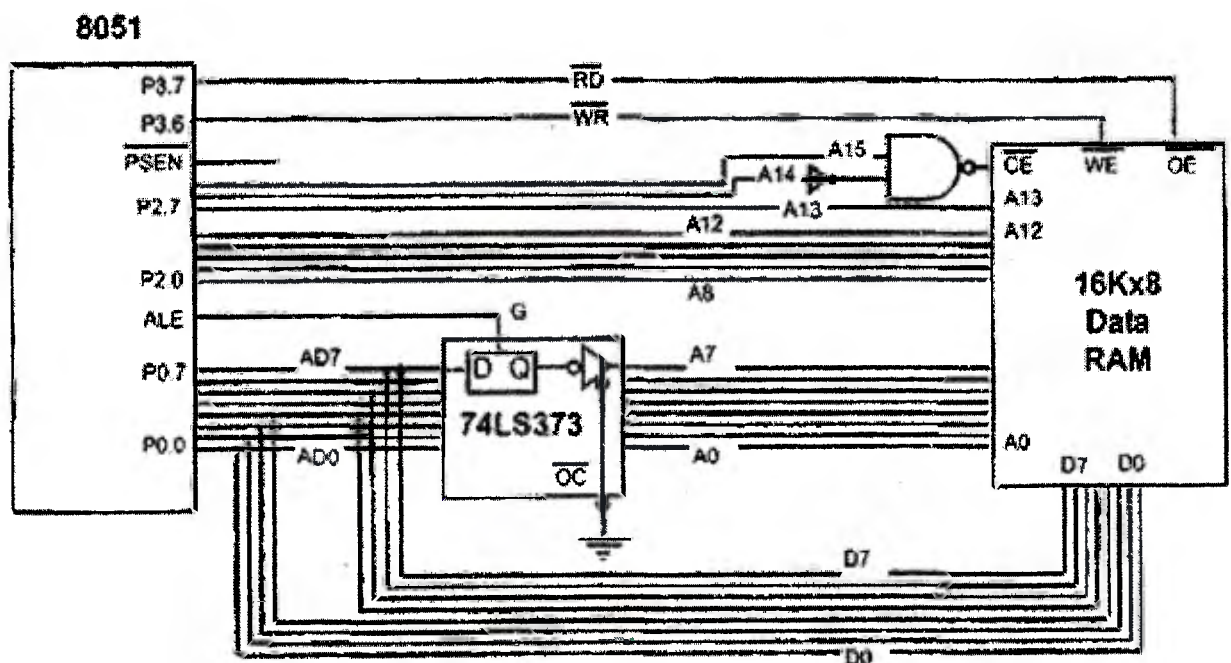
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D.J. Y. B.Tech (EEECS) Sem IV 13/7/22

DSY End Sem July 2022

Program: Electrical Engineering	**Duration: 3 Hours**
Course code: PC-BTE404	**Max. Marks: 100**
Name of the Course: Microprocessor and Microcontroller	**Sem. IV**

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

Q. No.		Points	CO	BI.	PI
1	State whether following statements are True/False. Justify the same.	20	1,2	5	1.4.1
(i)	Serial communication interrupt has a highest priority.				
(ii)	8051 has on chip DAC				
(iii)	A microcontroller is called a computer on a chip.				
(iv)	The 8051 is a 40-pin IC. Twenty-two pins are needed for the four I/O ports.				
(v)	P3.0 is used to provide RD signal for external memory connection. .				
2A (i)	Write a program to take data from P2 and send it to P1 continuously. Explain the same	4	1	3	1.3.1
(ii)	Write a program to move the content of 7th bit of the A register to pin P0.7, and also save it in RAM location 08H. Explain the code written	4	1	3	1.4.1
(iii)	An LED is connected to pin P1.7. Write a program using BIT directive to toggle LED forever.	4	1	3	1.3.1
2 B	With the help of neat diagram explain RAM allocation in 8051. Hence explain Register banks, stack, bit addressable RAM, scratch pad RAM.	8	2	2	1.3.1

Q3A	Draw the interfacing diagram with LCD and 8255, in which Port A is used to connect data bus of 8255. PB0, PB1 and PB2 are to be connected to RS, R/$\overline{W}$, E respectively. With respect to the diagram explain the following initialization command.
	
	MOV A , #80H
	MOV R1, #CONPORT
	MOVX @R1, A
		8	1	2	1.3.1

(ii)	Determine contents of register B after execution of the following MOV B , #94H MOV A , #79H XRL 0F0H, A	2	1	3	1.3.1

Q3 B	With the help of neat timing diagram explain the role of following pins of ADC 0804. (i) CS (ii) WR (iii) D0-D7 (iv) INTR (v) RD	10	2	2	1.3.1
4. A (i)	A program to generate a square waves, of 50 Hz frequency on P1.2 using interrupts is to be written. Assume XTAL = 11.0592 MHZ. The timer 0 is to be used in mode 1. Explain the initialization required. i.e. determine the values to be loaded in (i) timer registers (ii) Interrupt register	8	1	3	1.4.1
(ii)	Determine the contents of the accumulator after this operation **MOV A,#0BH** **ANL A,#2CH**	2	1	3	1.4.1
B (i)	A program to receive data at a baud rate of 4800 is to be written using timer 1 in mode 2. Explain initialization required i.e. values to be stored in TMOD, SCON, TH1	6	1	3	1.4.1
(ii)	With the help of neat diagram showing TCON and IE, explain the code lines below **MAIN : SETB TCON.2** ** MOV IE , # 10000100 B** **HERE : SJMP HERE** ** END**	4	1	3	1.4.1
5A	Explain with suitable diagram, interfacing of 4x 4 matrix keyboard with 8051.-Explain the method to confirm valid key press.	10	2	2	1.3.1
B	Explain the connection between 8051 and DAC0808 with the help of a neat interfacing diagram. Write a program to generate saw tooth waveform.	10	2	2	1.3.1
6	Explain what is represented by the following part of the code. Specify its significance.	20	1	3	1.4.1
(i)	**MOV A , #65H** **MOV R1, #57H** **MOV @R1, A** **INC R1** **MOV @R1, A**				
(ii)	** MOV SBUF,A** **ZZYY : JNB TI ZZYY** ** CLR TI** ** RET**				
(iii)	**ORG 000BH** **CPL P2.1** **RETI**				
(iv)	** MOV P1, #55H** ** MOV 32H, #200** **LOP1: CPL P1** ** ACALL DELAY** ** DJNZ 32H, LOP1**				

(v)	PUSH 04 PUSH 06 PUSH 0F0H POP 0E0H POP 02 POP 03				
7	Refer the dia. Determine the address space of data RAM. data ROM. Explain function of 8051/8031 pins PSEN, ALE, EA, RD, WR.	20	3	3	1.3.1

8031

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

25/5/22

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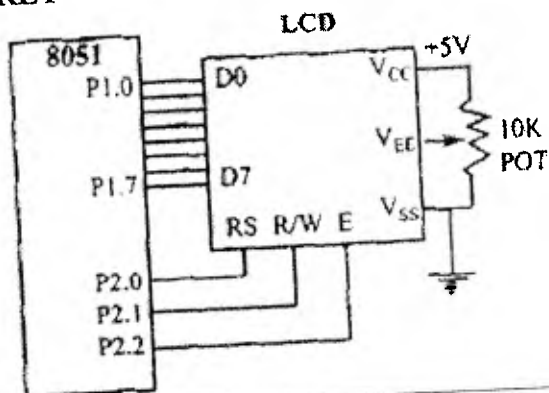
Munshi Nagar, Andheri (West), Mumbai – 400058

End Sem May 2022

Program: **Electrical Engineering**   Duration: 3 Hours

Course code: **PC-BTE404**   Max. Marks: 100

Name of the Course: **Microprocessor and Microcontroller**   Sem. IV
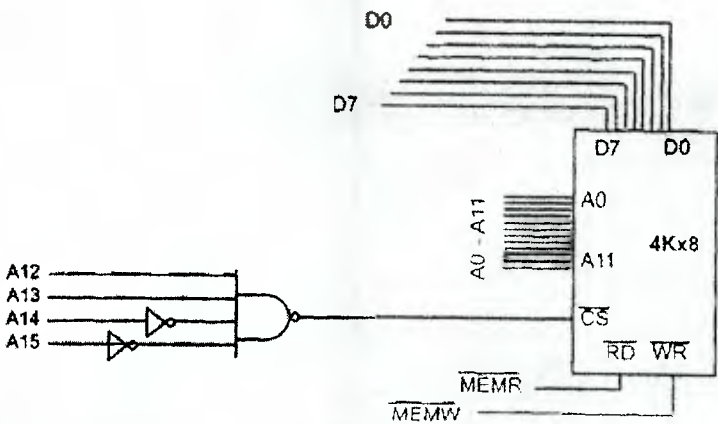
- Solve any five questions out of seven.
- Answers to all sub questions should be grouped together.
- Make suitable assumptions whenever necessary. State them clearly.
- Diagrams drawn to support your answer should be clearly visible.

Q. No.		Points	CO	Bl.	PI
1	Match the following two columns. Explain the same.	20	1	2	1.3.1
	<table><tr><td>TCON</td><td>contains status information</td></tr><tr><td>SBUF</td><td>Timer / counter control register.</td></tr><tr><td>TMOD</td><td>idle bit, power down bit</td></tr><tr><td>PSW</td><td>serial data buffer for Tx and Rx.</td></tr><tr><td>PCON</td><td>timer/ counter modes of operation</td></tr></table>				
2 A (i)	A switch is connected to pin P1 .7. Write a program to check the status of SW and perform the following: (use JB) (a) If SW=0, send letter 'N' to P2. (b) If SW=1, send letter 'Y' to P2. Explain the program written	4	1	3	1.3.1
(ii)	Write a program to transfer contents of register A, R0, R1 of bank 0 to the register B, R0, R1 of bank 1 respectively using stack operation. Explain the program written	4	1	3	1.4.1
(iii)	Write a program to see if the RAM location 37H contains an even value. If so, send it to P2. If not, make it even and then send it to P2. Explain the program written	4	1	3	1.4.1
B (i)	Assume that P1 is an input port connected to a temperature sensor. Write a program (using CJNE) to read the temperature and test it for the value 75. According to the test results, place the temperature value into the registers indicated by the following. **If T = 75, then A = 75 , If T < 75, then R1 = T, If T > 75, then R2 = T** Explain the program written	4	1	3	1.4.1
(ii)	A switch is connected to pin P 0.1. Write a program to check the status of SW and perform the following continuously. (a) If SW=0, send High to Low pulse to activate siren at P1.7 (Use carry flag to check the status) Explain the program written	4	1	3	1.4.1
Q3 A(i)	Explain IP register. Write an instruction to assign the highest priority to serial port interrupt.	4	1	2	1.4.1
(ii)	Determine contents of register B after execution of the following **MOV B , #44H MOV A , #67H ANL 0F0H, A**	2	1	3	1.4.1

			4	1	1	f.3.1.
(iii)	Explain difference between RET ands RETI		8	1	3	1.4.1
Q3 B (i)	A square wave signal is applied at pin P3.2. Generate from all pins of port 0, a square wave which is having half the frequency of the signal applied at INT0 pin (Pin 3.2). Explain the same.					
(ii)	If TCON has the value of 00000101B, what does it signifies?		2	1	3	1.4.1
4. A (i)	A program to generate two square waves, one of 5kHz frequency on P2.1 and another of 25kHz frequency on P1.0 using interrupts is to be written. Assume XTAL = 22MHZ. Both the timers are to be used in mode 2. Explain the initialization required. i.e. determine the values to be loaded in (i) timer registers (ii) Interrupt register		8	1	3	1.4.1

(ii)	Explain what is represented by the following program statements. Hence explain action performed.
	
	MOV A , #55H
	MOV R0, #47H
	MOV @R0, A
	INC R0
	MOV @R0, A
			2	1	3	1.4.1

B (i)	Explain what is represented by the following program. Specify its significance.
	
	        MOV TMOD #20H
	        MOV TH1, #0FAH
	        MOV SCON #50H
	        SETB TR1
	HERE: JNB RI HERE
	        MOV A, SBUF
	        MOV P1, A
	        CLR RI
	        SJMP HERE
			4	1	3	1.4.1

(ii)	Draw the interfacing diagram with LCD and 8051, in which Port 1 is used to connect data bus of 8051. P 2.0, P 2.1 and P2.2 are to be connected to RS, R/W̄ , E respectively. With respect to the diagram explain the following code. MOV P1, A SETB P2.0 CLR P2.1 SETB P2.2 ACALL DELAY CLR P2.2 RET		6	2	3	1.4.1

5 A	4x 4 matrix keyboard is to be interfaced with 8051 connecting D0 to D3 of port 1 as rows and D0 to D3 of port 2 as columns. Draw the diagram showing the connection. In the program to determine key pressed the steps involved are 1 confirming valid key press, 2. identifying from which row the key is pressed 3. determining which column the pressed key belongs to Explain the method used for step 2	10	2		1.4.1
B	Assuming that clock pulses are fed into pin T1, write a program for counter 1 in mode 2, to count the pulses and display the state of TL1 count on port 2 where LEDs are connected. Explain the same.	10	2	3	1.4.1

6
(i)
(ii)
(iii)
 	
(iv)
(v)
 	
(vi)
	State whether the following statements are T/F. Justify (any 5)
	WR is used to get the converted data out of the ADC0804 chip
	P3.4 has an alternative function as write control signal for external data memory.
	MOV A , #54H
	XRL A, #78H
	After executing above A will contain **2CH.**
	In IBM PC keyboards, a single microcontroller takes care of hardware and software interfacing of the keyboard.
	Following two instructions mean same thing.
	1) **BACK: DEC R0**
	            JZ BACK
	2) **BACK: DJNZ RO, BACK**
	Assuming crystal frequency of 12 MHz, The delay associated with HERE loop in delay subroutine is 0.5mS, It is given that machine cycles required for NOP is 1 and DJNZ is 2.
	
	DELAY : MOV R3 , #100
	HERE: NOP
	          NOP
	          NOP
	          DJNZ R3, HERE
	          RET
		20	1	5	1.4.1

7 A (i)	Determine the address assigned to the memory chip referring following dia. To assign the addresses from 7000H to 7FFFH to this memory chip what modification is required to be done? 	4	2	3	1.4.1

		4	2	1	1.4.1

(ii) Explain the code written with respect to the interfacing dia. shown.
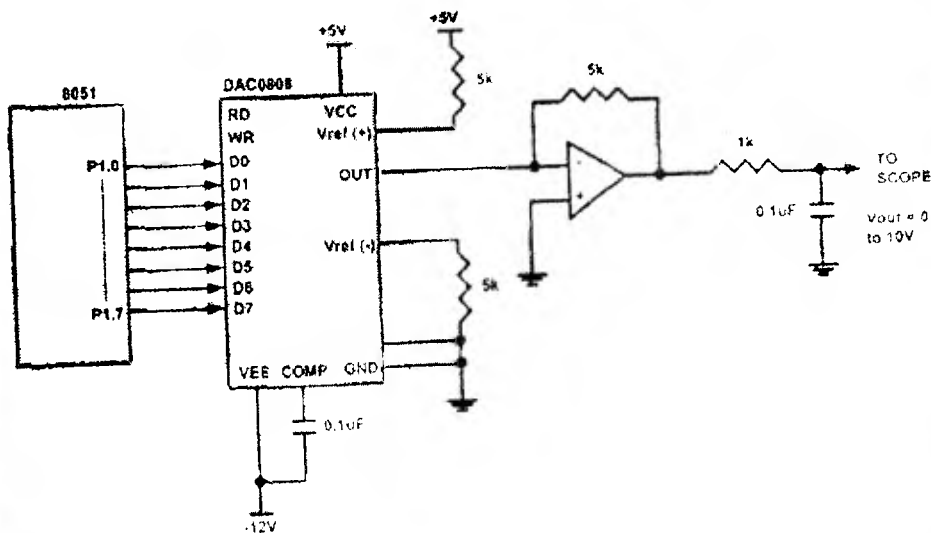

```
                CLR A
AGAIN:          MOV  P1, A
                INC A
                ACALL DELAY
                SJMP AGAIN
```

		2	2	3	1.4.1
(iii)	Draw control word format of 8255. Hence find the control word of the 8255 for the following configurations: All the ports of A, B, and C are output ports (mode 0).	2	2	3	1.4.1
B (i)	Stepper motor is connected to 8051 using port A of 8255. Determine the control word required. Explain the same. How is it moved to the control register?	4	2	3	1.4.1
(ii)	Referring the fig. above, find the I/O port addresses assigned to ports A, B, C, and the control register of 8255	4	2	3	1.4.1

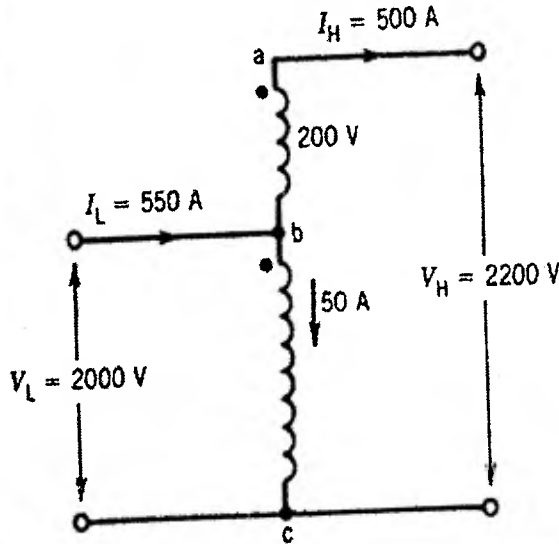|		2	1	3	1.4.1
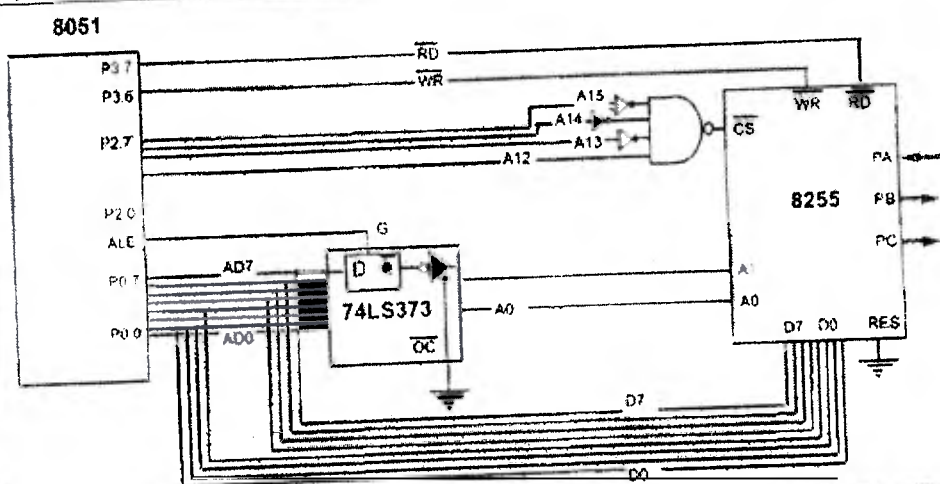
(iii)	MOV A, # 14H
	MOV 32H, #22H
	MOV R1, #32H
	ANL A, @R1
	Determine the value of A after execution of above.
		2	1	3	1.4.1

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Munshi Nagar, Andheri (W) Mumbai – 400058

REEXAM JULY 2022

D.J.Y.B.Tech (Electrical) Sem IV

Program: ELECTRICAL ENGG.   Duration: 3 hour

Course Code: PC-BTE405   Maximum Points: 100

Course Name: ELECTRICAL MACHINES 1   Semester: IV

18/7/22

Notes:

- Solve any five questions out of seven
- Make suitable assumptions wherever necessary
- Combine all the sub-questions in a given question together
- All Diagrams should be neat and clear

Q		Question	Marks	CO	BL	PI
1	A	Derive EMF induced in DC generator.	10	2	2	1.6.1
	B	Derive induced torque in DC motor.	10	2	2	1.6.1
2	A	Why parallel operation of transformer is preferred and what are the conditions be satisfied to connect transformers in parallel?	10	3	2	1.6.1
	B	Derive transformer equivalent circuit.	10	3	2	1.6.1
3		A four-pole dc machine has an armature of radius 12.5 cm and an effective length of 25 cm. The poles cover 75% of the armature periphery. The armature winding consists of 33 coils, each coil having seven turns. The coils are accommodated in 33 slots. The average flux density under each pole is 0.75T. 1. If the armature is lap-wound, (a) Determine the armature constant Ka. (b) Determine the induced armature voltage when the armature rotates at 1000 rpm. (c) Determine the current in the coil and the electromagnetic torque developed when the armature current is 400 A. (d) Determine the power developed by the armature. 2. If the armature is wave-wound, repeat parts (a) to (d) above. The current rating of the coils remains the same as in the lap-wound armature	20	2	3	2.5.2
4	A	Draw terminal voltage and current characteristic of	4	2	2	1.6.1

		separately excited DC generator				
	B	A single phase, 100 kVA, 2000/200 V two-winding transformer is connected as an auto transformer as shown in figure below such that more than 2000V is obtained at the secondary. The portion ab is the 200 V winding and the portion bc is the 2000 V winding. Compute the kVA rating as an auto transformer	16	3	3	2.5.2

$I_H = 500 \text{ A}$

a

200 V

$I_L = 550 \text{ A}$

b

50 A

$V_H = 2200 \text{ V}$

$V_L = 2000 \text{ V}$

c

5		In the magnetic circuit shown below, the relative permeability of the ferromagnetic material is 1200. Neglect magnetic leakage and fringing. All dimensions are in centimeters, and the magnetic material has a square cross-sectional area. a) Determine the air gap flux, b) The air gap flux density, and c) Magnetic field intensity in the air gap.	20	1	3	2.5.2
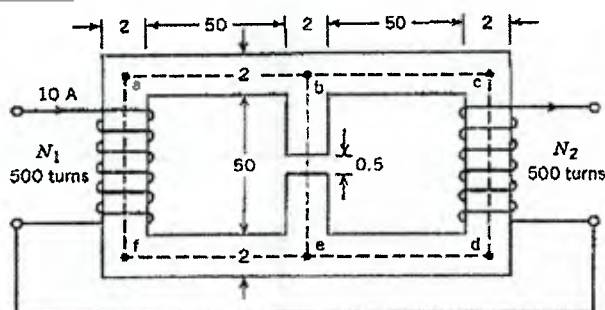
(a)

6	A	Where transformer vector groups are required to know? With the help of primary and secondary connections of transformer explain vector groups.	12	3	2	1.6.1
	B	What is hysteresis in magnetic circuits? With the help of B-H loop explain coercive force and residual flux density.	8	1	2	1.6.1
7	A	Draw power flow diagram of DC motor and generator	10	2	3	1.6.1
	B	Explain demagnetizing and cross magnetizing effect in DC machine.	10	2	2	1.6.1

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D S Y. B Tech (Elect) Sem IV
15/7/22

END SEMESTER EXAMINATION JULY 2022
(D SY)

Program: S.Y. B.Tech

Course Code: PC-BTE405

Course Name: Electrical Machines I
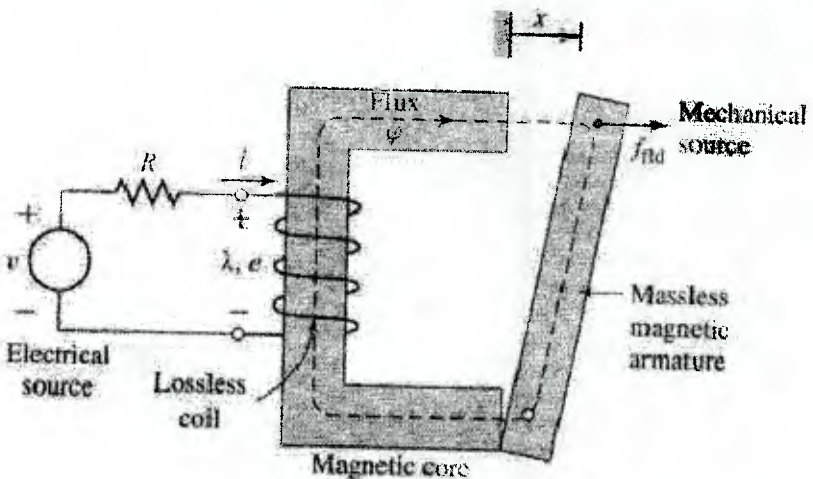
Duration: Three Hour

Maximum Points: 100

Semester: IV

Notes:
1. Question No 1 is compulsory..
2. Attempt any four questions out of remaining five.
2. Draw neat diagrams.
3. Assume suitable data if necessary.

Q.No.	Questions	Points	CO	BL	]
1.	Answer/Solve any four. a. Explain Biot Savart, Faraday's and Ampere Circuital Law b. Derive the condition for maximum efficiency of a transformer. c. Discuss iron losses in electromagnetic circuits. d. Explain full pitch and short pitch coil. e. Write short notes on High Frequency Transformer.	5+5+5+5			
2a	Discuss Lorentz Force Law explaining each term in the equation representing it with clarity.	08			
2.b	Derive the relation for energy stored in the electromechanical system shown below. 	12			
3a	Discuss the concepts of Electrical and Mechanical angle with appropriate diagram.	05			
3b	Draw the spacial distribution of MMF corresponding to Fig. No. 2 which is straighten representation of the cylindrical rotor of Fig. No. 1.	10			

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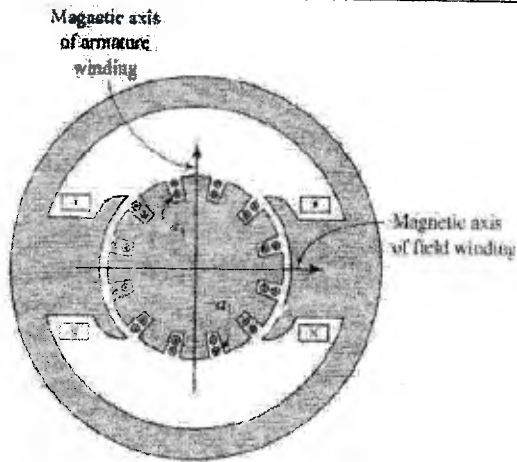
(DSY)

END SEMESTER EXAMINATION JULY 2022

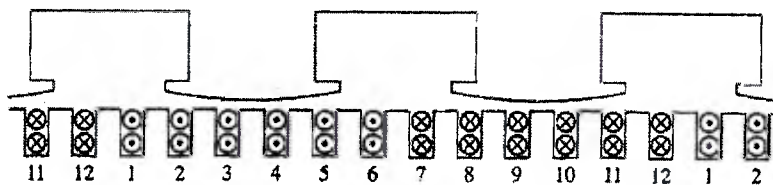**Fig. No. 1 : Cross –Section of a Two-Pole DC Machines**

Fig. No. 2: Developed sketch of the DC Machine of Fig. 1

3c	Define Breadth Factor and Angular Slot Pitch.	05			
4a	Discuss EMF polygon in details.	08			

4b	A DC generator has 24 armature conductors. Average e.m.f. induced in one conductor is 2V and each conductor is designed to handle a current of 5A. Calculate the rating of this generator if the number of parallel paths in this machines are
	
	    a) 2
	    b) 4 and
	    c) 6
		12			

5a	Derive the equation for torque in non-salient pole machines for the configuration shown in figures given. Apply the derivation to DC Machines for deriving modified equations of torque for the same.	12			

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END SEMESTER EXAMINATION JULY 2022
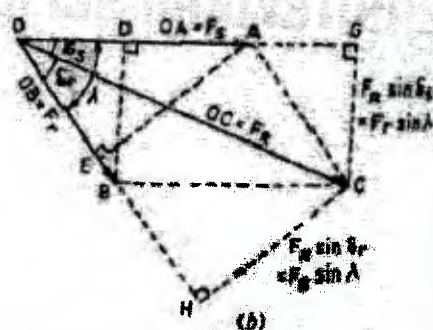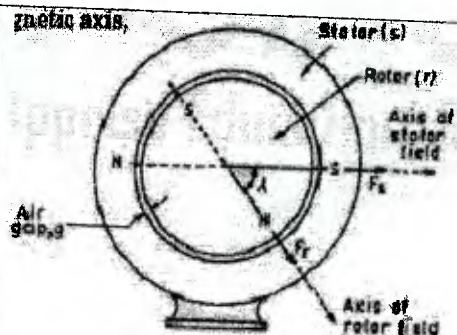
5b	Present appropriate analysis for phenomenon oscillating neutral in three phase transformer.	08			
6a	Discuss the concept of ratings of transformer in details.	07			
6b	Derive the equivalent circuit of single phase transformer w.r.t. primary as well as secondary. Draw phasor diagram for any one.	07			
6c	Derive simplified form of the equivalent circuit of single phase trahnsformer with relevant and appropriate assumptions generally used for transformer.	06			
7a	Discuss phasor group no 3 with various examples.	10			
7b	Write conditions for parallel operation of three phase transformers with analysis explaining the need for satisfaction of these conditions.	10			

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ENDSEM MAY 2022

S. Y. B. Tech (E7ad) Sem IV   30/5/22

Program: ELECTRICAL ENGG.   Duration: 3 hour

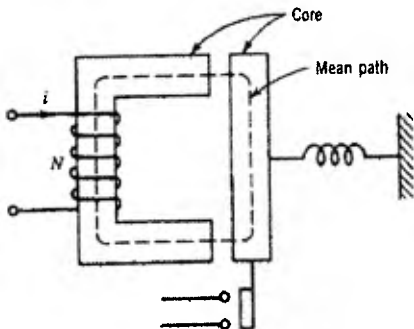Course Code: PC-BTE405   Maximum Points: 100

Course Name: ELECTRICAL MACHINES 1   Semester: IV

Notes:

- Solve any five questions out of seven
- Make suitable assumptions wherever necessary
- Combine all the sub-questions in a given question together
- All Diagrams should be neat and clear

Q		Question	Marks	CO	BL	PI
1	A.	If practically, given transformer's equivalent circuit required to be evaluated then which tests need to be performed? Explain required tests to be performed.	8	3	2	1.6.1
	B	What is armature reaction? How to overcome the effects of armature reaction?	10	2	2	1.6.1
	C.	In 2 pole DC machine 90 mechanical degrees corresponds to how many electrical degrees?	2	1	3	2.5.2
2	A.	A 12-pole dc generator has a simplex wave-wound armature containing 144 coils of 10 turns each. The resistance of each turn is 0.011 ohm. Its flux per pole is 0.05 Wb, and it is turning at a speed of 200 rpm. (a) How many current paths are there in this machine? (b) What is the induced armature voltage of this machine? (c) What is the effective armature resistance of this machine? (d) If a 1 Kilo-ohm resistor is connected to the terminals of this generator, what is the resulting induced counter torque on the shaft of the machine? (Ignore the internal armature resistance of the machine.)	14	2	3	2.5.2
	B	Why and where the high frequency transformers are used?	6	3	2	1.6.1
3	A	Which three conditions must be satisfied to voltage buildup in self excited DC generator?	6	2	2	1.6.1

	B	Tests are performed on a 1 phase, 10 kVA, 2200/220V; 60 Hz transformer and the following results are obtained.	14	3	3	2.5.2

	Open-circuit test (HV side open)	Short Circuit test (Low voltage side shorted)
Voltmeter	220 V	150 V
Ammeter	2.5 A	4.55 A
Wattmeter	100 W	215 W

1. Calculate approximate equivalent parameters referred to HV side
2. Determine power factor for no load and short circuit tests

4	A	How three phase transformer vector groups are labelled?	4	3	2	1.6.1

	B	Fig. E1.1 represents the magnetic circuit of a primitive relay. The coil has 500 turns and the mean core path is $lc = 360$ mm. When the air gap lengths are 1.5 mm each, a flux density of 0.8 tesla is required to actuate the relay. The core is cast steel.	16	1	3	2.5.2

(a) Find the current in the coil.
(b) Compute the values of permeability and relative permeability of the core.
(c) If the air gap is zero, find the current in the coil for the same flux density (0.8 T) in the core.

B-H characteristic of core material

B (Tesla)	0.2	0.4	0.6	0.8	1	1.2
H (AT/meter)	190	310	400	510	700	1000

FIGURE E1.1 $N = 500$ turns, $l_c = 36$ cm

5	A	For the magnetic circuit of Fig. E1.2, N = 400 turns. Mean core length $lc = 50$ cm. Air gap length $lg = 1.0$ mm. Cross-sectional area $Ac = Ag = 15$ cm^2. Relative permeability of core $\mu r = 3000$. i	10	1	3	2.5.2

= 1.0 A. Find
- (a) Flux and flux density in the air gap.
- (b) Inductance of the coil

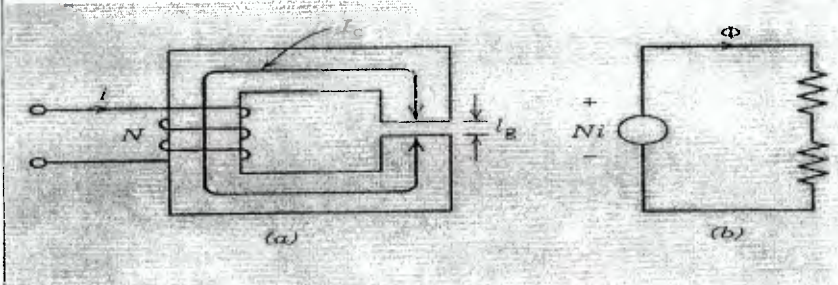Fig. E1.2

B	Draw and Explain open circuit characteristics of separately excited DC generator.	10	2	2	1.6.1
6	A	A 12 kW, 100V, 1000rpm DC shunt generator has armature resistance of Ra=0.1 ohm, shunt field winding resistance R_{fw}= 80 ohm, and N_f= 1200 turns per pole. The rated field current is 1 ampere. The magnetizing characteristic at 1000 rpm is given in table. The machine is operated as a separately excited dc generator at 1000 rpm with rated field current. 1. Neglect the armature reaction effect. Determine the terminal voltage at full load 2. Consider that armature reaction at full load is equivalent to 0.06 field amperes a. determine the full load terminal voltage b. Determine the field current required to make terminal voltage 100 V at full load condition	14	2	3	2.5.2

Ea (V)	22	44	67	84	98	105	108	112
I_f (A)	0.21	0.42	0.61	0.83	0.94	1.1	1.2	1.4

B	What is voltage regulation of transformer? How much is ideal voltage regulation?	6	3	2	1.6.1
7	A	Draw power flow diagram of DC motor and generator	6	2	3	1.6.1
	B	What is the condition to get maximum efficiency of transformer? Derive maximum efficiency of transformer.	7	3	2	1.6.1
	C	Derive induced torque in DC motor.	7	2	3	1.6.1

③