

DEPARTMENT OF MATHEMATICS
"T3 Examination, December-2021"

SEMESTER	THIRD	DATE OF EXAM	10/12/2021
SUBJECT NAME	BUSINESS MATHEMATICS	SUBJECT CODE	LWH216
BRANCH	MATHEMATICS	SESSION	MORNING
TIME	9:00AM-12:00PM	MAX. MARKS	100
PROGRAM	BBA/B.Com.(LAW)	CREDITS	4
NAME OF FACULTY	Dr Kalpana Shukla	NAME OF COURSE COORDINATOR	Dr Kalpana Shukla <i>Deepa</i>

Note: Note: Part A & Part B : All questions are compulsory.

Part C: Attempt any two questions.

Part D: Attempt any two questions.

Q.NO.	QUESTIONS	MAR KS	CO ADDRESSED	BLOOM'S LEVEL	PI
PART-A	1(A) $A = \{3, 4, 5\}$ and $B = \{6, 3, 8\}$ find the symmetric difference of A& B .	2	C01	BT1	[1.1.2]
	1(B) Discuss the algebra of sets with their applications in real life.	2	C01	BT2	[1.1.2]
	1(C) If mean is 10 and coefficient of variation is 5, then find the standard deviation .	2	C02	BT3	[1.1.1]
	1(D) If 25 % of the items are less than 20 and 25 % are more than 40, then find the quartile deviation .	2	C02	BT3	[2.1.1]
	1(E) The mean of 200 observations was 50. Later on, it was discovered that two observations were wrongly read as 92 and 8 instead of 192 and 88. Find out the correct mean.	2	C03	BT3	[2.1.2]
PART-B	Q2 (A) State the positive and negative correlation with suitable examples.	2	C01	BT1	[1.1.1]
	Q2 (B) Comment on the following results obtained from the given data. The coefficient of regression of Y on X is 4.2, and coefficient of regression X on Y is 0.40.	2	C02	BT3	[1.1.1]

PART-C	Q2 (C)	Discuss the features of good measure of dispersion.	2	C02	BT1	[1.1.1]																					
	Q2 (D)	Determine the mean deviation for the data values 5, 3, 7, 8, 4, 9.	2	C02	BT1	[2.1.1]																					
	Q2 (E)	What are the different forms of presentation of data?	2	C02	BT1	[1.1.1]																					
	Q3 (A)	Compute the regression lines for the following data	8	C04	BT4	[2.3.1]																					
	Q3 (B)	In a partially destroyed laboratory record of an analysis of correlation data, the following results: Variance of $x=9$ Regression equations: $8x-10y+66=0$, $10x-18y-214=0$. What were (a) the mean values of x and y , (b) the standard deviation y , and (c) the coefficients between x and y .	12	C04	BT3	[3.1.2]																					
	Q4	Find the two lines of regression and from them compute the Karl Pearson's coefficient of correlation, if it is given that $\sum X = 205$; $\sum Y = 300$; $\sum XY = 7900$; $\sum X^2 = 6500$; $\sum Y^2 = 10,000$; and $N=10$.	20	C03	BT3	[3.1.2]																					
	Q5 (A)	If two regression coefficients are 0.8 and 0.2, what would be the value of coefficients of correlation?	10	C03	BT4	[2.1.2]																					
	Q5 (B)	The two lines of regression of a correlation analysis are $2X+3Y-8=0$ and $x+2y-5=0$ Find the value of the correlation coefficient and the variance of Y , if it is given that the variance of X is 12	10	C04	BT1	[2.1.1]																					
PART-D	Q6 (A)	Calculate the coefficients of correlation between the marks obtained by 8 students in mathematics and statistics	15	C03	BT3	[3.1.1]																					
	Q6(B)	State and discuss the application of correlation in the business Law and criminal law.	5	C01	BT2	[1.1.1]																					
	Q7 (A)	Calculate the spearman's rank correlation coefficients for the following data:	8	C04	BT3	[2.1.2]																					
		<table border="1"> <thead> <tr> <th>Per son</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th> </tr> </thead> <tbody> <tr> <td>Per son</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td> </tr> </tbody> </table>	Per son	1	2	3	4	5	6	7	8	9	10	Per son	1	2	3	4	5	6	7	8	9	10			
Per son	1	2	3	4	5	6	7	8	9	10																	
Per son	1	2	3	4	5	6	7	8	9	10																	

Find the mean deviation of the following frequency distribution:

Class	0-6	6-12	12-18	18-24	24-30
Frequency	8	10	12	9	5

Q7
(B)

Calculate the coefficients of correlation between the marks obtained by 8 students in mathematics and statistics

Students	A	B	C	D	E	F	G	H
Math	25	30	32	35	37	40	42	45
Sta	08	10	15	17	20	23	24	25

Q8
(A)

In Business Law College ten competitors are ranked by three judges in the following order:

Ranked by three judges in the following order.											
J1	5	3	1	7	2	1	4	1	4	6	
J2	1	6	5	1	3	2	4	9	7	8	
J3	6	4	9	8	1	2	3	1	5	7	

Q8
(B)

Use the correlation coefficient to determine which pair of judges has the nearest approach to common taste in beauty.

12

C03

BT3

[2.1.2]

12

C03

BT3

[2.1.2]

8

C03

BT3

[2,1,2]

* * * * *

END

DEPARTMENT OF MATHEMATICS

"T3 Examination, Dec.-2021"

SEMESTER	III	DATE OF EXAM	02-12-2021
SUBJECT NAME	PDE, Probability & Numerical Analysis	SUBJECT CODE	MAH203B
BRANCH	Engineering	SESSION	Morning
TIME	9:00AM-12:00 NOON	MAX. MARKS	100
PROGRAM	Mechanical Engineering	CREDITS	4
NAME OF FACULTY	Dr.Y. K Sharma	NAME OF COURSE COORDINATOR	Dr. Y K Sharma <i>[Signature]</i>

Note: All questions are compulsory.

	Q.NO.	QUESTIONS	MAR KS	CO ADDRESSED	BLOO M'S LEVEL	PI														
PART-A& B	Q1(A)	Solve $p(p^2 + q^2) y = q z$.	5	C01	BT2	1.1.1 2.1.1 3.2.2 4.1.2														
	Q1(B)	Form a PDE of $xyz = f(x+y+z)$	5	C01	BT2	1.1.1 2.1.1 3.2.2 4.1.2														
	Q2(A)	A bag A contains 2 white and 4 black balls. Another bag B contains 5 white and 7 black balls. A ball is transferred from the bag A to the bag B. Then a ball is drawn from the bag B. Find the probability that it is white.	5	C02	BT2	1.1.1 2.1.1 3.2.2 4.1.2														
	Q2(B)	A problem in Mathematics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved?	5	C02	BT2	1.1.1 2.1.1 3.2.2 4.1.2														
	Q3(A)	Calculate $\int_{0}^{\pi} \sin x dx$ by dividing the interval into ten equal parts by Trapezoidal rule.	10	C03	BT3	1.1.1 2.1.1 3.2.2 4.1.2														
	Q3(B)	Solve $\int_{0}^{1} \frac{dx}{1+x^2}$ by Simpson's 1/3 rule taking $h = \frac{1}{6}$.	10	C03	BT3	1.1.1 2.1.1 3.2.2 4.1.2														
PART-C&D	Q4(A)	Find I'(93) and I''(93) from the following data				1.1.1 2.1.1 3.2.2 4.1.2														
		<table border="1"> <tr> <td>x : 60</td> <td>75</td> <td>90</td> <td>105</td> <td>120</td> </tr> <tr> <td>F(x) :</td> <td>28.2</td> <td>30.2</td> <td>43.2</td> <td>40.9</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>37.7</td> </tr> </table>	x : 60	75	90	105	120	F(x) :	28.2	30.2	43.2	40.9					37.7	10	C03	BT3
x : 60	75	90	105	120																
F(x) :	28.2	30.2	43.2	40.9																
				37.7																

.....

	Apply Lagrange's formula , find a cubic polynomial which approximate the following data : x : -2 -1 2 3 f(x): -12 -8 3 5	10	CO3	BT3	1.1.1 2.1.1 3.2.2 4.1.2
Q4(B)	Use Taylor series method, find y (0.1) and y (0.2) given that $\frac{dy}{dx} = y^2 + x, y(0) = 1.$	10	CO4	BT3	1.1.1 2.1.1 3.2.2 4.1.2
Q5(A)	Solve numerically $\frac{dy}{dx} = y^2 + x^2 - 2$ using Milne's predictor method for x = 0.3 given that y (0) = 1. The value of y for x = -0.1, 0.1, 0.2 should be computed by Euler's method.	10	CO4	BT3	*
Q5(B)	Apply R K Method of fourth order to find an approximate value of y for x = 0.2 in steps of 0.1, if $\frac{dy}{dx} = x + y^2$ given that y = 1 when x = 0.	10	CO4	BT4	1.1.1 2.1.1 3.2.2 4.1.2
Q6(A)	Using Picard's method of successive approximation to solve $\frac{dy}{dx} = y^2 + x^2 + 1$, given that y (0) = 0, find y (0.1)	10	CO4	BT4	1.1.1 2.1.1 3.2.2 4.1.2
Q6(B)					

***** END *****

DEPARTMENT OF MATHEMATICS

"T3 Examination, December-2021"

SEMESTER	THIRD	DATE OF EXAM	02/12/2021
SUBJECT NAME	STATISTICS - II	SUBJECT CODE	MAII205B
BRANCH	MATHEMATICS	SESSION	MORNING
TIME	9 AM - 12 PM	MAX. MARKS	100
PROGRAM	B.Sc. (II)	CREDITS	4
NAME OF FACULTY	Ms. Savitta Saini	NAME OF COURSE COORDINATOR	Ms. Savitta Saini

*Note. All questions are compulsory.**Answer*

Q.NO.	QUESTIONS	MA RK S	CO ADD RES SED	BLO OM' S LEV EL	PI
1(A)	A fair coin is tossed until a head appears. Let X denote the number of tosses required. Find the density function of X . Also find mean and variance of X .	5	C01	BT3	1.1.1 2.1.1 3.2.2 4.1.2
1(B)	Suppose X is a random variable with $E[X] = 10$ and $Var[X] = 25$. Find the positive numbers a and b such that $Y = aX - b$ has mean 0 and variance 1.	5	C01	BT3	1.1.1 2.1.1 3.2.2 4.1.2
2(A)	A car hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as Poisson variate with mean 1.5. Calculate the proportion of days on which (i) neither car is used, and (ii) some demand is refused. ($e^{-1.5} = 0.2231$)	5	C02	BT3	1.1.1 2.1.1 3.2.2 4.1.2
2(B)	The life of an electronic tube of a certain type may be assumed to be normally distributed with mean 155 hours and standard deviation 19 hours. What is the probability (i) That the life of randomly chosen tube is between 136 hours and 174 hours. (ii) That the life of a randomly chose tube is less than 117 hours.	5	C02	BT3	1.1.1 2.1.1 3.2.2 4.1.2

3(A)

Before an increase in excise duty on tea, 800 people out of a sample of 1000 persons were found to be tea drinkers. After an increase in the duty, 800 persons were known to be tea drinkers in a sample of 1200 people. Do you think that there has been a significant decrease in the consumption of tea after the increase in the excise duty?

10	CO4	BT4	1.1.1 2.1.1 3.2.2 4.3.4 5.1.1 7.1.1 8.2.1 10.3.3 11.2.2 13.1.1
----	-----	-----	---

3(B)

A sample of size of 600 persons is selected at random from a large city that shows that the percentage of males in the sample is 53. It is believed that the ratio of males to the total population in the city is 0.5. Test whether the belief is confirmed by the observation.

10	CO4	BT4	1.1.1 2.1.1 3.2.2 4.3.4 5.1.1 7.1.1 8.2.1 10.3.3 11.2.2 13.1.1
----	-----	-----	---

4(A)

A sample of 1000 students from a university was taken and their average weight was found to be 112 pounds with a standard deviation of 20 pounds. Could the mean weight of the students in the population be 120 pounds?

10	CO4	BT4	1.1.1 2.1.1 3.2.2 4.3.4 5.1.1 7.1.1 8.2.1 10.3.3 11.2.2 13.1.1
----	-----	-----	---

4(B)

A random sample of 200 villages from Coimbatore district gives the mean population per village at 485 with a S.D. of 50. Another random sample of same size from the same district gives the mean population per village at 510 with a S.D. of 40. Is the difference between the mean values given by the samples statistically significant? Justify your answer.

10	CO4	BT4	1.1.1 2.1.1 3.2.2 4.3.4 5.1.1 7.1.1 8.2.1 10.3.3 11.2.2 13.1.1
----	-----	-----	---

5(A)

The theory predicts the proportion of beans in the four groups, G_1 , G_2 , G_3 and G_4 should be in the ratio 9:3:3:1. In an experiment with 1600 beans the numbers in the four groups were 882, 313, 287 and 118. Does the experimental results support the theory.

10	CO4	BT4	1.1.1 2.1.1 3.2.2 4.3.4 5.1.1 7.1.1 8.2.1 10.3.3 11.2.2 13.1.1
----	-----	-----	---

Records taken of the number of male and female births in 800 families having four children are as follows:

No. of male births	0	1	2	3	4
No. of female births	4	3	2	1	0
No. of families	32	178	290	236	94

5(B)

10 CO4 BT4

1.1.1
2.1.1
3.2.2
4.3.4
5.1.1
7.1.1
8.2.1
10.3.3
11.2.2
13.1.1

Test whether the data are consistent with hypothesis that the binomial law holds and the chance of male birth is equal to the that of female birth, namely $p = q = 1/2$.

6(A)

10 CO4 BT4

1.1.1
2.1.1
3.2.2
4.3.4
5.1.1
7.1.1
8.2.1
10.3.3
11.2.2
13.1.1

The height of 6 randomly chosen sailors in inches are 63, 65, 68, 69, 71 and 72. Those of 9 randomly chosen soldiers are 61, 62, 65, 66, 69, 70, 71, 72 and 73. Test whether the sailors are on the average taller than the soldiers.

6(B)

10 CO4 BT4

1.1.1
2.1.1
3.2.2
4.3.4
5.1.1
7.1.1
8.2.1
10.3.3
11.2.2
13.1.1

Memory capacity of 9 students was tested before and after a course of meditation for a month. State whether the course was effective or not from the data below (in same units).

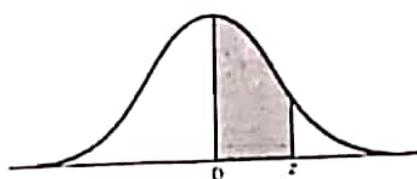
Befo re	10	15	9	3	7	12	16	17	4
After	12	17	8	5	6	11	18	20	3

***** END *****

.....

APPENDIX

VII. AREA UNDER STANDARD NORMAL CURVE



	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0388	0.0419	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1255	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1759	0.1719	0.1678	0.1634	0.1590	0.1546	0.1502	0.1458	0.1414	0.1379
0.5	0.2254	0.2190	0.2124	0.2057	0.2089	0.2023	0.2057	0.2099	0.2139	0.2174
0.6	0.2757	0.2690	0.2624	0.2557	0.2589	0.2522	0.2554	0.2586	0.2617	0.2649
0.7	0.3260	0.3111	0.3042	0.2973	0.2904	0.2834	0.2864	0.2894	0.2923	0.2952
0.8	0.3763	0.3610	0.3539	0.3467	0.3395	0.3323	0.3251	0.3178	0.3106	0.3133
0.9	0.4266	0.4186	0.4102	0.4012	0.3924	0.3829	0.3735	0.3640	0.3545	0.3449
1.0	0.4763	0.4638	0.4511	0.4385	0.4258	0.4131	0.3994	0.3770	0.3490	0.3030
1.1	0.5253	0.5065	0.4866	0.4598	0.4229	0.3749	0.3244	0.2662	0.1980	0.0915
1.2	0.5749	0.5609	0.5388	0.5007	0.4525	0.3944	0.3262	0.2480	0.1697	0.0777
1.3	0.6242	0.6049	0.5665	0.4882	0.4099	0.3115	0.2147	0.1162	0.0462	-0.0177
1.4	0.6732	0.6207	0.5522	0.4236	0.2951	0.2655	0.2779	0.2992	0.3096	0.3119
1.5	0.7222	0.6315	0.5357	0.3779	0.2382	0.3994	0.4406	0.4418	0.4429	0.4441
1.6	0.7712	0.6432	0.5474	0.3484	0.2495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.8199	0.6541	0.5573	0.3582	0.2691	0.4999	0.4608	0.4616	0.4625	0.4633
1.8	0.8584	0.6644	0.5673	0.3682	0.2791	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.8964	0.6744	0.5764	0.3782	0.2891	0.4350	0.4356	0.4361	0.4367	0.4377
2.0	0.9339	0.6836	0.5853	0.3882	0.2991	0.4024	0.4046	0.4050	0.4054	0.4057
2.1	0.9708	0.6920	0.5939	0.3982	0.3091	0.3795	0.3814	0.3834	0.3857	0.3890
2.2	0.9974	0.7004	0.6015	0.4081	0.3191	0.3575	0.3578	0.3881	0.3884	0.3887
2.3	0.9993	0.7086	0.6098	0.4181	0.3291	0.3608	0.3609	0.3911	0.3913	0.3916
2.4	0.9998	0.7166	0.6172	0.4281	0.3391	0.3629	0.3631	0.3932	0.3934	0.3936
2.5	0.9998	0.7240	0.6241	0.4381	0.3481	0.3645	0.3646	0.3949	0.3951	0.3952
2.6	0.9993	0.7306	0.6306	0.4481	0.3571	0.3660	0.3661	0.3962	0.3963	0.3964
2.7	0.9991	0.7367	0.6367	0.4581	0.3669	0.3670	0.3671	0.3972	0.3973	0.3974
2.8	0.9984	0.7425	0.6426	0.4677	0.3767	0.3678	0.3679	0.3979	0.3980	0.3981
2.9	0.9974	0.7472	0.6472	0.4771	0.3864	0.3681	0.3685	0.3985	0.3986	0.3986
3.0	0.9964	0.7517	0.6517	0.4868	0.3968	0.3689	0.3691	0.3989	0.3990	0.3990

Table 3: CHI-SQUARE (χ^2)
Significant Values $\chi^2(\alpha)$ of χ^2 Distribution Right Tail Areas
for Given Probability α ,
 $P = P_r(\chi^2 > \chi^2(\alpha)) = \alpha$
And its Degrees of Freedom (d.f.)

Degree of freedom (v)	Probability (Level of Significance)						
	0.99	0.95	0.50	0.10	0.05	0.02	0.01
1	0.000157	0.0394	1.65	2.706	3.811	5.214	6.635
2	0.0201	1.03	3.86	4.605	5.991	7.821	9.210
3	1.15	3.52	2.366	6.251	7.815	9.837	11.311
4	2.97	7.11	3.357	7.779	9.888	11.638	13.277
5	5.71	11.45	4.351	9.236	11.070	13.388	15.086
6	8.72	20.635	6.348	10.645	12.592	15.033	16.812
7	12.39	24.67	6.346	12.017	14.067	16.622	18.475
8	16.46	27.63	7.344	13.362	15.507	18.168	20.090
9	20.88	33.25	8.343	14.684	16.919	19.679	21.639
10	25.58	39.40	9.340	15.987	18.307	21.161	23.209
11	30.03	45.75	10.341	17.275	19.675	22.618	24.725
12	35.57	52.26	11.340	18.549	21.026	24.054	26.217
13	41.10	58.92	12.340	19.812	22.362	25.472	27.688
14	46.60	65.57	13.339	21.064	23.685	26.873	29.141
15	52.23	72.21	14.339	22.307	24.996	28.259	30.578
16	58.81	79.92	15.338	23.542	26.296	29.633	32.000
17	64.40	86.67	15.338	24.769	27.587	30.995	33.409
18	70.01	93.39	17.338	25.989	28.869	32.346	34.805
19	76.63	10.117	18.338	27.204	30.144	33.687	36.191
20	82.20	10.851	19.337	28.412	31.410	35.020	37.566
21	88.79	11.591	20.337	29.615	32.671	36.343	38.932
22	95.42	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	37.65	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
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	14.933	18.493	29.336	40.256	43.773	47.962	50.892

Note. For degrees of freedom (v) greater than 30, the quantity $\sqrt{2\chi^2} - \sqrt{2v-1}$ may be used as a normal

Appendix 695

N. S. LEVINSKI: POINTS OF FISHER'S F-DISTRIBUTION

Table 2 : SIGNIFICANT VALUES $t_v(\alpha)$ OF t-DISTRIBUTION
 (TWO TAIL AREAS) $\{ |t| \geq t_v(\alpha) \} = \alpha$

α	Probability (Level of Significance)					
	0.50	0.10	0.05	0.02	0.01	0.001
1	1.00	1.31	1.71	2.18	2.33	2.39
2	0.82	0.92	1.30	1.97	2.93	3.46
3	0.77	2.32	3.48	4.54	5.84	12.94
4	0.74	2.13	2.78	3.75	4.60	8.61
5	0.73	2.02	2.57	3.37	4.03	6.86
6	0.72	1.94	2.45	3.14	3.71	5.95
7	0.71	1.90	2.37	3.00	3.50	5.41
8	0.71	1.80	2.31	2.90	3.36	5.04
9	0.70	1.83	2.26	2.82	3.25	4.78
10	0.70	1.81	2.23	2.76	3.17	4.59
11	0.70	1.80	2.20	2.72	3.11	4.44
12	0.70	1.78	2.18	2.68	3.06	4.32
13	0.69	1.77	2.16	2.65	3.01	4.22
14	0.69	1.76	2.15	2.62	2.98	4.14
15	0.69	1.75	2.13	2.60	2.95	4.07
16	0.69	1.75	2.12	2.58	2.92	4.02
17	0.69	1.74	2.11	2.57	2.90	3.97
18	0.69	1.73	2.10	2.55	2.88	3.92
19	0.69	1.73	2.09	2.54	2.86	3.88
20	0.69	1.73	2.09	2.53	2.85	3.85
21	0.69	1.72	2.08	2.52	2.83	3.83
22	0.69	1.72	2.07	2.51	2.82	3.79
23	0.69	1.71	2.07	2.50	2.81	3.77
24	0.69	1.71	2.06	2.49	2.80	3.75
25	0.68	1.71	2.06	2.49	2.79	3.73
26	0.68	1.71	2.06	2.48	2.78	3.71
27	0.68	1.70	2.05	2.47	2.77	3.69
28	0.68	1.70	2.05	2.47	2.76	3.67
29	0.68	1.70	2.05	2.46	2.76	3.66
30	0.68	1.70	2.04	2.46	2.75	3.65
...	0.67	1.66	1.96	2.34	2.58	3.29

DEPARTMENT OF MATHEMATICS
"T3 Examination, December-2021"

SEMESTER	III	DATE OF EXAM	06-12-2021
SUBJECT NAME	Group Theory	SUBJECT CODE	MAH206B
BRANCH	Mathematics	SESSION	I
TIME	9:00AM-12:00 PM	MAX. MARKS	100
PROGRAM	B.Sc.(H)	CREDITS	4
NAME OF FACULTY	Dr. Kamlesh Kumar	NAME OF COURSE COORDINATOR	Dr. Kamlesh Kumar <i>Deepa</i>

Note: Part A, B, C: All questions are compulsory.

Q.NO.	QUESTIONS	MAR KS	CO ADDRESSED	BLOO M'S LEVEL	PI
PART-A	1(A) Show that the set \mathbb{Q}^+ of all positive rational numbers is an abelian group under the binary operation \bullet defined by $a \bullet b = ab/3$, where ab is the ordinary multiplication of two positive rational numbers a and b .	5	CO1	BT2	PI 1.1.1 PI 2.1.1
	1(B) Show that $a^{-1}Ha = \{a^{-1}ha : h \in H\}$ is a subgroup of a group G where H is a subgroup of G and $a \in G$.	5	CO1	BT2	PI 1.1.1 PI 2.1.1
	2(A) Let H be a subgroup of a Group (G, \circ) then show that $aH = bH$ or $aH \cap bH = \emptyset$ for $a, b \in G$.	5	CO2	BT1	PI 1.1.1 PI 2.1.1 PI 4.3.1
	2(B) Prove that every group of prime order is cyclic.	5	CO2	BT2	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.4.1
PART-B	Q3(A) State and prove first theorem of isomorphism.	10	CO3	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1

	If α and β are disjoint cycles, then $\langle \alpha \rangle \cap \langle \beta \rangle = \{I\}$.	10	CO3	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
Q4(A)	If $f: (G_1, o_1) \rightarrow (G_2, o_2)$ is a group homomorphism then prove that $Ker f = \{e_1\} \Leftrightarrow f$ is one-one.	10	CO3	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
4(B)	If $f: (G_1, o_1) \rightarrow (G_2, o_2)$ is a group homomorphism then show that $f(a^{-1}) = [f(a)]^{-1}$ where $a \in G_1$.	10	CO3	BT1	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
Q5(A)	If $o(G) = p^2$ where p is a prime number then prove that G is abelian.	10	CO4	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1
5(B)	Find all normal subgroup of S_3 and S_4 . Verify the class equation for S_3 .	10	CO4	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1
Q6(A)	For any group G prove that $Inn(G) \cong G / Z(G)$ where $Inn(G)$ is the group of inner automorphisms of G and $Z(G)$ is the centre of the group G .	10	CO4	BT4	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
6(B)	Define conjugate relation \sim on the group G and show that relation \sim is an equivalence relation on G .	10	CO4	BT4	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1

END

DEPARTMENT OF MATHEMATICS

"T3 Examination, December - 2021"

SEMESTER	III	DATE OF EXAM	10/12/2021
SUBJECT NAME	Partial Differential Equation	SUBJECT CODE	MAH207B
BRANCH	Mathematics	SESSION	I
TIME	3hrs	MAX. MARKS	100
PROGRAM	B.Sc(H)	CREDITS	4
NAME OF FACULTY	Dr. Dinesh Tripathi	NAME OF COURSE COORDINATOR	Dr. Dinesh Tripathi

Note: All questions are compulsory.

PART-A	Q.NO.	QUESTIONS	MAR KS	CO ADDRESSED	BLOOM 'S LEVEL	PI
	1(A)	Solve $(y+z)p + (z+x)q = x+y$.	5	CO1	BT4	1.1.1 3.1.1 4.1.1
	1(B)	Solve $p^2 + q^2 = z^2(x+y)$ by Charpit's method.	5	CO1	BT4	1.1.1 3.1.1 4.1.1
	2(A)	Find the all possible solution of $u_{xx} + u_{tt} = 0$.	5	CO2	BT3	4.1.1 4.1.2 4.1.4
	2(B)	Using the method of separation of variables, solve $u_x = 2u_t + u$, $u(x,0) = 6e^{-3x}$.	5	CO2	BT3	4.1.1 4.1.2 4.1.4
	3(A)	Find the surface satisfying the equation $r+t-2s=0$ and the condition that $bz=y^2$ when $x=0$ and $az=x^2$ when $y=0$.	10	CO3	BT4	4.1.1 4.1.2 4.1.4
	3(B)	Solve $(D^2 + D' + 4)z = e^{4x-y}$.	10	CO3	BT4	4.1.1 4.1.2 4.1.4
	3(C)	Solve $r-3s+2t-p+2q=(2+4x)e^{-y}$.	10	CO3	BT4	4.1.1 4.1.2 4.1.4
PART-C	3(D)	Find the P.I. $(D^3 + D^2D' - DD'^2 - D'^3)z = e^y \cos 2x$.	10	CO3	BT4	4.1.1 4.1.2 4.1.4

PART-D

4(A)	Reduce the PDE $(x^2D^2 - xyDD' - 2y^2D'^2 + xD - 2yD')z = \log\frac{y}{x} - \frac{1}{2}$ in PDE with constant coefficient and solve it.	10	CO4	BT4	4.1.1 4.1.2 4.1.4
4(B)	Solve $xyr + x^2s - yp = x^3e^y$ by direct integration.	10	CO4	BT4	4.1.1 4.1.2 4.1.4
4(C)	Reduce $\frac{\partial^2 z}{\partial x^2} = (1+y)^2 \frac{\partial^2 z}{\partial y^2}$ in canonical form.	10	CO4	BT4	4.1.1 4.1.2 4.1.4
4(D)	Solve the PDE $x^2r - y^2t + px - qy = x^2$ by reducing it to in normal form.	10	CO4	BT4	4.1.1 4.1.2 4.1.4

END

DEPARTMENT OF MATHEMATICS

"T3 Examination, Dec-2021"

SEMESTER	III	DATE OF EXAM	13-12-2021
SUBJECT NAME	Real Analysis	SUBJECT CODE	MAH204B
BRANCH	Mathematics	SESSION	I
TIME	9.00AM-12.00 PM	MAX. MARKS	100
PROGRAM	B.Sc.(H) Mathematics	CREDITS	4
NAME OF FACULTY	Mr. Ramapati Maurya	NAME OF COURSE COORDINATOR	Mr. Ramapati Maurya <i>[Signature]</i>

Note: All questions are compulsory.

	Q.NO.	QUESTIONS	MARKS	CO ADDRESSE D	BLOOM' S LEVEL	PI
PART-A	1(A)	<p>Give examples of sets which are</p> <ul style="list-style-type: none"> (i) Bounded above but not bounded below, (ii) Both open and closed (iii) Bounded below but not bounded above (iv) Open but not closed (v) Having finite number of limit points 	5	CO1 CO2	BT2	PI 1.1.1 PI 2.1.1
PART-B	1(B)	What do you mean by open set. Prove that intersection of two open sets is an open set.	5	CO2	BT4	PI 1.1.1 PI 2.1.1
PART-C	Q2(A)	Show that the sequence $\{f_n\}$ defined by $f_n = \sqrt{n+1} - \sqrt{n}, \forall n \in N$, is convergent.	4	CO3	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1
PART-C	2(B)	<p>State monotone convergence theorem. Hence show that the sequence $\{S_n\}$, defined by the recursion formula $S_{n+1} = \sqrt{3}S_n, S_1 = 1$, converges to $\sqrt{3}$.</p> <p>Prove that the necessary condition for convergence of an infinite series $\sum a_n$ is that $\lim_{n \rightarrow \infty} a_n = 0$. Also show that this is not the sufficient condition for the convergence of the infinite series $\sum a_n$.</p>	6	CO3	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.4.1
PART-C	Q3(A)	6	CO4	BT4	PI 1.1.1 PI 2.1.1 PI 4.3.1

PART-D

	Discuss the convergence of the series $\sum_{n=2}^{\infty} \frac{1}{n^2 \log n}$.	6	CO4	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
3(B)	State and prove Cauchy's n^{th} root test. Also test for the convergence of the series $\frac{x}{1} + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \dots, x > 0$.	8	CO4	BT4	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
3(C)	Show that the positive term geometric series $1 + r + r^2 + \dots$ converges for $r < 1$ and diverges to $+\infty$ for $r \geq 1$.	6	CO4	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
Q4(A)	If $\sum a_n$ and $\sum b_n$ are two positive term series such that $\lim_{n \rightarrow \infty} \frac{a_n}{b_n} = l$, where l is a non zero finite number, then prove that the two series converge or diverge together.	7	CO4	BT4	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
4(B)	Test for the convergence of the series $1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$, for $x > 0$.	7	CO4	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1
4(C)	Show that the series $\sum \frac{(-1)^{n+1}}{3n-2}$ is conditionally convergent.	6	CO5	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1
5(B)	State and prove Weierstrass M -test for the uniform convergence. Examine for the uniform convergence of the series $\sum r^n \sin n\theta$ for $0 \leq r < 1$.	7	CO5	BT4	PI 1.1.1 PI 2.1.1 PI 4.3.1
5(C)	Test for the uniform convergence of the sequence of functions $\left\{ \frac{nx}{1+n^2x^2} \right\}$ on any interval containing zero.	7	CO5	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
Q6(A)	Show that the series $\sum (-1)^n \left(\frac{n+2}{2^{n+5}} \right)$ is absolutely convergent.	6	CO5	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
6(B)	State Abel's test. Hence show that the series $\sum \frac{(-1)^n}{n} x ^n$ is uniformly convergent in $-1 \leq x \leq 1$.	7	CO5	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
6(C)	Show that the series $\sum_{n=1}^{\infty} \frac{\sin(x^2 + nx)}{n(\sqrt{n} + 1)}$ converges uniformly and absolutely for all real values of x .	7	CO5	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1

***** END *****

DEPARTMENT OF MATHEMATICS
 "T3 Examination, Dec.-2021"

SEMESTER	III	DATE OF EXAM	04-12-2021
SUBJECT NAME	Integral Equations & Calculus of Variation	SUBJECT CODE	MAH601B
BRANCH	Mathematics	SESSION	Morning
TIME	9:00AM-12:00 NOON	MAX. MARKS	100
PROGRAM	M.Sc. Mathematics	CREDITS	4
NAME OF FACULTY	Dr. Deepa Arora	NAME OF COURSE COORDINATOR	Dr. Deepa Arora <i>(Signature)</i>

Note: All questions are compulsory.

	Q.NO.	QUESTIONS	MARKS	CO ADDRESSED	BL OO M'S LEV EL	PI
PART-A&B	Q1(A)	Convert $y''(x) - 3y'(x) + 2y(x) = 4 \sin x$ with initial conditions $y(0) = 1, y'(0) = -2$ into a Volterra integral equation of the second kind. Conversely, derive the original differential equation with initial conditions from the integral equation obtained.	10	CO1	BT3	1.1.1
	Q2(A)	Find the iterated kernels (or functions) for the kernel $K(x, t) = e^x \cos t; a = 0, b = \pi$.	6	CO2	BT3	1.1.1
	Q2(B)	Show that the integral equation $y(x) = \lambda \int_0^\pi (\sin x \sin 2t) y(t) dt$ has no eigen values	4	CO2	BT2	1.1.1
PART-C&D	Q3(A)	State and prove the necessary condition for existence of extremal. Hence, find the extremal and the extremum value of the functional $I[y(x)] = \int_0^1 (y'^2 + 12xy) dx$, $y(0) = 0, y(1) = 1$.	10	CO4	BT3	1.1.1
	Q3(B)	Find the extremal of the functional $I[y(x)] = \int_{x_0}^{x_1} [(y'')^2 - 2(y')^2 + y^2 - 2y \sin x] dx$	10	CO4	BT3	1.1.1
	Q4(A)	Find the solid of maximum volume formed by the revolution of a given surface.	10	CO4	BT4	1.1.1 2.3.1
	Q4(B)	What is the difference between Euler-Poisson Equation & Euler's Ostrogradsky equations? Also, write the equations of the both. Show that the functional	10	CO4	BT2 BT3	1.1.1

	$\int_0^1 \left[2x + \left(\frac{dx}{dt} \right)^2 + \left(\frac{dy}{dt} \right)^2 \right] dt$ <p>Such that $x(0) = 0, y(0) = 0, x(1) = 1.5, y(1) = 1$ is stationary for $x = 1 + \frac{t^2}{2}, y = t.$</p>			
Q5(A)	<p>In each of the following boundary value problem examine whether a Green's function exists and if it does, construct it.</p> <p>(i) $y'' = 0; y(0) = y(1), y'(0) = y'(1).$</p> <p>(ii) $y'' = 0; y(0) = y'(1), y'(0) = y(1).$</p>	10	CO3	BT3 1.1.1
Q5(B)	<p>Solve the boundary value problem using Green's function</p> <p>$y'' + y = x^2; y(0) = y\left(\frac{\pi}{2}\right) = 0.$</p>	10	CO3	BT3 1.1.1 2.1
Q6(A)	<p>Transform the problem $\frac{d^2y}{dx^2} + y = x, y(0) = 1, y'(1) = 0$ to a Fredholm integral equation.</p>	10	CO3	BT4 1.1.1
Q6(B)	<p>Find Green's function for the Bessel operator of order n,</p> $L(y) = \frac{d}{dx} \left(x \frac{dy}{dx} \right) - \frac{n^2}{x} y, (n \neq 0)$ <p>relevant to the end conditions $y(0) = y(1) = 0.$</p>	10	CO3	BT3 1.1.1 2.1

***** END *****

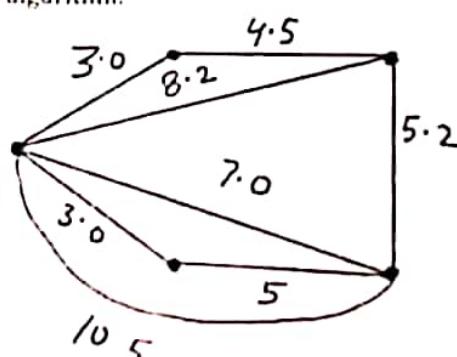
DEPARTMENT OF MATHEMATICS

"T3 Examination, December -2021"

SEMESTER	3rd	DATE OF EXAM	8-12-2021
SUBJECT NAME	Graph Theory	SUBJECT CODE	MAII605 B
BRANCH	Mathematics	SESSION	Ist
TIME	9:00 AM-12:00 PM	MAX. MARKS	100
PROGRAM	M.Sc.	CREDITS	4
NAME OF FACULTY	Dr. Ankita Gaur	NAME OF COURSE	Dr. Ankita Gaur
		COORDINATOR	<i>Durga</i>

Note: All questions are compulsory.

PART-A	Q.NO.	QUESTIONS	MAR KS	CO ADDRESS ED	BLOOM'S LEVEL	PI
	Q.1.	If $A(G)$ is the incidence matrix of a connected graph G then prove that rank of $A(G) = n - 1$, where n is the number of vertices in G .	10	C01	BT-2	PI 1.1.1 PI 2.2.1, PI 3.1.1 PI 3.1.2* PI 3.1.1 PI 4.1.1
	Q.2	Find minimal spanning tree for the following graph using both Kruskal's and Prim's algorithm.	10	C02	BT-3	PI 1.1.1, PI 2.2.1, PI 3.1.1 PI 3.1.2* PI 3.1.1 PI 4.1.1



.....

PART-B

Q.3	<p>Apply Dijkstra's algorithm to the graph given below and find the shortest path from a to g</p> <pre> graph LR A((A)) --- 30 B((B)) A --- 19 C((C)) B --- 40 E((E)) B --- 6 D((D)) C --- 12 D C --- 50 F((F)) D --- 35 E D --- 11 F E --- 8 G((G)) F --- 20 G </pre>	10	CO3	BT4	PI 1.1.1, PI 2.2.1, PI 3.1.1 PI 3.1.2* PI 3.1.1 PI 4.1.1,
Q.4	<p>Prove that every cut set in a connected graph G must contain at least one branch of every spanning tree.</p>	15	CO3	BT4	PI 1.1.1, PI 2.2.1, PI 3.1.1 PI 3.1.2* PI 3.1.1 PI 4.1.1,
Q.5	<p>Prove that there are $\frac{n-1}{2}$ edge disjoint Hamiltonian circuits in a complete graph of n odd vertices, where $n \geq 3$. Also solve the travelling Salesman problem for the graph given below.</p> <pre> graph TD a((a)) --- 11 b((b)) a --- 7 c((c)) a --- 13 e((e)) b --- 3 d((d)) b --- 4 e c --- 7 d </pre>	15	CO3	BT4	PI 1.1.1, PI 2.2.1, PI 3.1.1 PI 3.1.2* PI 3.1.1 PI 4.1.1,
Q.6	<p>Let G be a simple graph with n vertices which is regular of degree r. Prove that the chromatic number of $G \geq \frac{n}{n-r}$.</p>	10	CO4	BT4	PI 1.1.1, PI 2.2.1, PI 3.1.1 PI 3.1.2* PI 3.1.1 PI 4.1.1,
Q.7	<p>Prove that for any connected graph G with n vertices and e edges the total number of regions R is equal to $e - n + 2$.</p>	15	CO4	BT4	PI 1.1.1, PI 2.2.1, PI 3.1.1 PI 3.1.2* PI 3.1.1 PI 4.1.1,
Q.8	<p>Prove that every tree with two or more vertices is 2 chromatic but converse is not true. Also give an example of a graph which is 2 chromatic but not a tree.</p>	15	CO4	BT4	PI 1.1.1, PI 2.2.1, PI 3.1.1 PI 3.1.2* PI 3.1.1 PI 4.1.1,

PART-C

DEPARTMENT OF MATHEMATICS
"T3 Examination, December-2021"

SEMESTER	THIRD	DATE OF EXAM	10/12/2021
SUBJECT NAME	OPERATIONS RESEARCH	SUBJECT CODE	MAH604B
BRANCH	MATHEMATICS	SESSION	MORNING
TIME	09:00AM-02:00PM	MAX. MARKS	100
PROGRAM	M.Sc.	CREDITS	4
NAME OF FACULTY	Dr Kalpana Shukla	NAME OF COURSE COORDINATOR	Dr Kalpana Shukla <i>Deepr</i>

Note: Note: Part A & Part B : All questions are compulsory.

Part C: Attempt any two questions.

Part D: Attempt any two questions.

	Q.NO.	QUESTIONS	MAR KS	CO ADDRESSED	BLOOM'S LEVEL	PI
PART-A	Q1 (A)	If a system is of m simultaneous linear equations in n unknowns(m<n) then how many number of basic variables will be there in linear programming problem?	2	C01	BT2	[1.1.2]
	Q1 (B)	Comment on the statement 'A function cannot be both convex and concave'. Give suitable example to prove or disprove.	2	C01	BT2	[1.1.2]
	Q1 (C)	Show that the function $f(x) = e^x$ is a convex function over R^1 .	2	C02	BT3	[2.1.1]
	Q1 (D)	What will be the case, if two constraints do not intersect in the positive quadrant of the graph? Using graphical method, find the optimum solution for	2	C02	BT1	[1.1.2]
	Q1 (E)	$\max z = 10x + 15y;$ $2x + y \leq 26, x + 2y \leq 28, y - x \leq 5$ $\text{and } x \geq 0, y \geq 0.$	2	C03	BT3	[3.1.2] 1
PART-	Q2 (A)	Write the dual of the following: $\max z = x - 15y;$ $2x - y \leq 6, x + 2y \geq 8, y - x = 15 \text{ and}$ $x \geq 0, y \geq 0.$	2	C01	BT2	[2.1.1]



PART-C	Q2 (B)	State the mathematical formulation of Travelling salesman problem with explanation.	2	CO2	BT1	[2.1.1]																													
	Q2 (C)	State the necessary & sufficient condition for a basic feasible solution to Z minimum LPP to be an optimum solution.	2	CO2	BT1	[1.1.2]																													
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>Suppl y</th></tr> </thead> <tbody> <tr> <td>w1</td><td>20</td><td>25</td><td>28</td><td>31</td><td>200</td></tr> <tr> <td>w2</td><td>32</td><td>28</td><td>32</td><td>41</td><td>180</td></tr> <tr> <td>w3</td><td>18</td><td>35</td><td>24</td><td>32</td><td>110</td></tr> <tr> <td>Dem and</td><td>150</td><td>40</td><td>180</td><td>70</td><td></td></tr> </tbody> </table>		A	B	C	D	Suppl y	w1	20	25	28	31	200	w2	32	28	32	41	180	w3	18	35	24	32	110	Dem and	150	40	180	70				
	A	B	C	D	Suppl y																														
w1	20	25	28	31	200																														
w2	32	28	32	41	180																														
w3	18	35	24	32	110																														
Dem and	150	40	180	70																															
Q2 (D)	Solve the above transportation problem by Least Method.	2	CO2	BT3	[2.1.2]																														
Q2 (E)	State the in sequencing, if smallest time for a job belongs to machine 1 then what will be the place of the job.	2	CO2	BT1	[1.1.1]																														
Q3 (A)	For the following profit table:																																		
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>Suppl y</th></tr> </thead> <tbody> <tr> <td>P1</td><td>10</td><td>12</td><td>15</td><td>8</td><td>130</td></tr> <tr> <td>P2</td><td>14</td><td>12</td><td>9</td><td>10</td><td>150</td></tr> <tr> <td>P3</td><td>20</td><td>5</td><td>7</td><td>18</td><td>170</td></tr> <tr> <td>Dem and</td><td>90</td><td>100</td><td>140</td><td>120</td><td></td></tr> </tbody> </table>		A	B	C	D	Suppl y	P1	10	12	15	8	130	P2	14	12	9	10	150	P3	20	5	7	18	170	Dem and	90	100	140	120				
	A	B	C	D	Suppl y																														
P1	10	12	15	8	130																														
P2	14	12	9	10	150																														
P3	20	5	7	18	170																														
Dem and	90	100	140	120																															
(i) State the rim requirement of transportation problem and discuss the degeneracy also. (ii) Find the best initial basic feasible solution by using VAM method.					B CO4 BT4 [2.3.1]																														
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>Suppl y</th></tr> </thead> <tbody> <tr> <td>w1</td><td>5</td><td>3</td><td>6</td><td>2</td><td>19</td></tr> <tr> <td>w2</td><td>4</td><td>7</td><td>9</td><td>1</td><td>37</td></tr> <tr> <td>w3</td><td>3</td><td>4</td><td>7</td><td>5</td><td>34</td></tr> <tr> <td>Dem and</td><td>16</td><td>18</td><td>31</td><td>25</td><td></td></tr> </tbody> </table>		A	B	C	D	Suppl y	w1	5	3	6	2	19	w2	4	7	9	1	37	w3	3	4	7	5	34	Dem and	16	18	31	25					
	A	B	C	D	Suppl y																														
w1	5	3	6	2	19																														
w2	4	7	9	1	37																														
w3	3	4	7	5	34																														
Dem and	16	18	31	25																															
3(B)	Find the optimal solution of the Transportation problem.					12 CO4 BT3 [3.1.2]																													
	An engineering company has branches in Bombay, Calcutta, Delhi & Madras. A branch manager is to be appointed, one at each city, out of five candidates I, II, III and IV depending on branch manager and the city varies in lakhs of rupees as per detail profit table is given below:																																		
Q4			20	CO3	BT4	[4.1.1]																													

	Bomb ay	Calcut ta	Delhi	Madra ss
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5

(i) Suggest which manager should be assigned to which city so as to get maximum total monthly business.

(ii) Find the alternate optimal path, if exists.

A salesman has to visit the following cities with the given cost below.

	A	B	C	D	E
A		3	6	2	3
B	3		5	2	3
C	6	5		6	4
D	2	2	6		6
E	3	3	4	6	

**Q5
(A)**

Find the travel cost with optimal route.

15

C03

BT4

[4.1.1]

**Q5
(B)**

State the mathematical formulation of transportation and discuss as a case of linear programming problem.

5

C04

BT1

[1.1.1]

Find an optimal sequence, total elapsed and idle time for the following sequencing problems of four jobs and five machines and when passing out is not allowed of which processing time [in hours] is given below.

Mach ines	M1	M2	M3	M4
A	11	4	2	11
B	8	1	8	8
C	12	2	3	12
D	13	2	2	13

**Q6
(A)**

State the conditions to be follow for job sequencing problem.

15

C03

BT3

[4.1.2]

For the game: Payoff is given

Player A

Player B	2	-2
	4	-6

**Q7
(A)**

Determine the best strategies for players A and B and also the values of the game for them. And is this game strictly determinable?

8

C04

BT3

[2.1.2]

**Q7
(B)**

(i) What is the two persons zero sum game? Explain it with suitable example?
(ii) Solve the following game by dominance:

12

C03

BT3

[3.1.2]

Player B

	I	II	III	IV
I	18	4	6	4
Player A	6	2	13	7
II				
III	11	5	17	3
IV	7	6	12	2

Using graphical method, calculate the minimum time needed to process jobs 1 and 2 on five machines A, B, C, D & E, i.e. for each machine find the job which should be done first. Also calculate the total elapsed time to complete both the jobs:

JOB 1	Sequence	A	B	C	D	E
	Time	2	3	4	6	2
JOB 2	Sequence	B	C	A	D	E
	Time	4	5	3	2	6

Q8 (A)

10

CO3

BT3

[3.1.2]

Determine the optimal Job sequence for BAC order and describe this rule.

Job s	J1	J2	J3	J4	J5	J6	J7
Machine (time)							
[A]	3	8	7	4	9	8	7
[B]	4	3	2	5	1	4	3
[C]	6	7	5	11	5	6	12

Q8 (B)

10

CO3

BT3

[3.1.2]

END

DEPARTMENT OF MATHEMATICS
"T3 Examination, DEC-2021"

SEMESTER	III	DATE OF EXAM	13/12/2021
SUBJECT NAME	FLUID MECHANICS	SUBJECT CODE	MAH602B
BRANCH	MSc(Maths)	SESSION	I
TIME	9:00-12:00PM	MAX. MARKS	100
PROGRAM	MSc(Maths)	CREDITS	4
NAME OF FACULTY	Dr.Ruchi Gupta	NAME OF COURSE COORDINATOR	Dr.Ruchi Gupta <i>Deepa</i>

Note: All questions are compulsory.

	Q.NO.	QUESTIONS	MAR KS	CO ADDRESSED	BLO OM'S LEVE L	PJ
PART-A	Q1	Find expression for the acceleration in Cartesian coordinates of an element of fluid in motion.	10	CO3, CO2, CO5	BT3	1.1.1.1. 2.2.1.1
	Q2	Drive the equation of continuity in spherical polar coordinates.	10	CO2	BT3	1.1.1.1. 1.2.2.1. 1.5.1.1
PART-B	Q3(a)	Between the fixed boundaries $\theta = \frac{\pi}{6}$ and $\theta = -\frac{\pi}{6}$ there is a two dimensional liquid motion due to a source at the point ($r=c$, $\theta = \alpha$) and a sink at the origin absorbing water at the same rate as the source produces. Find the stream function and show that one of the stream lines is a part of the curve $r^3 \sin\alpha = c^3 \sin 3\theta$.	10	CO4, CO5	BT4	1.1.2.2. 1.1.
	(b)	What arrangement of sources and sink will give rise to the function $w = \log(z - \frac{a^2}{z})$. Draw a rough sketch of the stream lines. Prove that two of the stream lines subdivide into the circle $r = a$ and axis of y .	10	CO4, CO5	BT4	1.1.2.2. 1.1.
	Q4 (a)	State and prove Bernoulli's theorem for steady inviscid flow in a conservation field of force and discuss the nature of the constant.	10	CO2, CO5	BT4	1.1.1.1. 1.2.2.1. 1.5.1.1

	A stream in a horizontal pipe, after passing a contraction in the pipe at which its sectional area is A is delivered at atmospheric pressure at a place, where the sectional area is B. Show that if a side tube is connected with the pipe from a reservoir at a depth $\frac{s^2}{2g} \left(\frac{1}{A^2} - \frac{1}{B^2} \right)$ below the pipe, s being the delivery per second.	10	CO2, CO3, CO5	BT4	1.1.1.1. 1.2.2.1. 1.5.1.1 3.1.1
(b)	Derive Navier-Stokes equations of motion of a fluid in a general form.	10	CO3	BT3	3.1.1
Q5(a)	Show that for an incompressible steady flow with constant viscosity, the velocity components $u(y) = y \frac{U}{h} + \frac{h^2}{2\mu} \left(-\frac{dp}{dx} \right) \frac{y}{h} \left(1 - \frac{y}{h} \right), v = w = 0$ Satisfy the equation of motion, when the body force is neglected. h,U,dp/dx are constants and p=p(x).	10	CO3, CO2	BT4	1.1.2.2. 1.1.
(b)	Discuss generalized plane Couette flow.	10	CO3 CO2	BT3	3.1.1
Q6(a)	One surface (nearly plane) is fixed and another surface (plane) rotates with angular velocity ω about an axis perpendicular to its plane and there is a film of viscous fluid between them. Prove that the pressure p satisfies the equation $h^3 \left(\frac{\partial^2 p}{\partial r^2} + \frac{1}{r} \frac{\partial p}{\partial r} + \frac{1}{r^2} \frac{\partial^2 p}{\partial \theta^2} \right) + \frac{\partial h^3}{\partial r} \frac{\partial p}{\partial r} + \frac{1}{r^2} \frac{\partial h^3}{\partial \theta} \frac{\partial p}{\partial \theta} = 6\mu\omega \frac{\partial h}{\partial \theta}$ Where (r, θ) are polar coordinates in the plane of the film, the origin being in the axis of the film of rotation, and h is the thickness of the film.	10	CO2 CO3, CO5	BT4	1.1.2.2. 1.1.
(b)					

***** END *****

DEPARTMENT OF PHYSICS

"T3 Examination, December-2021"

SEMESTER	III	DATE OF EXAM	09.12.2021
SUBJECT NAME	Mathematical Physics III	SUBJECT CODE	PHH202B-T
BRANCH	Physics	SESSION	I
TIME	09:00AM – 12:00PM	MAX. MARKS	100
PROGRAM	B. Sc.	CREDITS	4
NAME OF FACULTY	Dr. Sarvesh Kumar	NAME OF COURSE COORDINATOR	Dr. Sarvesh Kumar

Note: All questions are compulsory from Part A, B, C and D.

Q.NO.	QUESTIONS	MAR KS	CO ADD RESS ED	BLO OM'S LEV EL	PI
PART-A	1(A) Use Cauchy's integral formula to evaluate $\int_C \frac{z}{z^2 - 3z + 2} dz$, where C is the circle $ z - 2 = \frac{1}{2}$.	5	CO1	BT3	2.2.1, 2.3.1
	1(B) Find the Laurent Series expansion of $f(z) = \frac{1}{(z+1)(z+3)}$ for $ z > 3$.	5	CO1	BT4	2.2.1, 2.3.1
PART-B	2(A) Express the function $f(x) = \begin{cases} 1, & \text{when } x \leq 1 \\ 0, & \text{when } x > 1 \end{cases}$ As a Fourier integral. Hence evaluate $\int_0^\infty \frac{\sin \lambda \cos \lambda x}{\lambda} d\lambda$	5	CO2	BT3	2.2.1, 2.3.1, 5.4.1

PART C	2(B)	Obtain Fourier Cosine transform of $f(x) = \begin{cases} x, & \text{for } 0 < x < 1 \\ 2-x, & \text{for } 1 < x < 2 \\ 0, & \text{for } x > 2 \end{cases}$	5	CO2	BT4	2.2.1, 2.3.1, 5.4.1
	3(A)	A problem of statistics is given to three students A, B and C, whose chances of solving it are $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved?	5	CO3	BT3	2.3.1, 5.4.1, 10.2.1
	3(B)	Find the Binomial distribution, whose mean is 5 and variance is $10/3$.	5	CO3	BT4	2.3.1, 5.4.1, 10.2.1
	4	If 10% of bolts produced by a machine are defective. Determine the probability that out of 10 bolts, chosen at random (i) 1; (ii) none; (iii) at most 2 bolts will be defective.	10	CO3	BT3	2.3.1, 5.4.1, 10.2.1
	5(A)	An urn I contains 3 white and 4 red balls and an urn II contains 5 white and 6 red balls. One ball is drawn at random from one of the urns and is found to be white. Find the probability that it was drawn from urn I.	4	CO3	BT3	2.3.1, 5.4.1, 10.2.1
	5(B)	Using Poisson distribution, find the probability that the ace of spades will be drawn from a pack of well-shuffled cards at least once in 104 consecutive trials.	6	CO3	BT3	2.3.1, 5.4.1, 10.2.1
	6(A)	The diameter of an electric cable is assumed to be continuous random variate with probability density function: $f(x) = 6x(1-x), 0 \leq x \leq 1$ (i) Verify that above is probability density function. (II) Find the mean and variance.	5	CO3	BT3	2.3.1, 5.4.1, 10.2.1

PART-D	6(B)	In a male population of 1000, the mean height is 68.16 inches and standard deviation is 3.2 inches. How many men may be more than 72 inches? [Given that $P(z \geq 1.2) = 0.115$ and $z = (x - \mu) / \sigma$].	5	CO3	BT4	2.3.1, 5.4.1, 10.2.1
	7 (A)	Let G be a finite group. Show that there exists a positive integer n such that $a^n = e$ for all $a \in G$.	5	CO4	BT2	2.2.1, 2.3.1, 10.2.1
	7(B)	If the group G has three elements, show it must be abelian.	5	CO4	BT2	2.2.1, 2.3.1, 10.2.1
	8	Solve the differential equations (i) $\left(\frac{dy}{dx}\right)^2 - 7 \frac{dy}{dx} + 10 = 0$ (ii) $y + x \frac{dy}{dx} = x^4 \left(\frac{dy}{dx}\right)^2$	10	CO4	BT3	2.2.1, 2.3.1, 10.2.1
	9	Solve the differential equations (i) $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^2 x$ (ii) $x^2(y - px) = yp^2$, where $p = \frac{dy}{dx}$	10	CO4	BT3	2.2.1, 2.3.1, 10.2.1
	10(A)	Write short note on fractals.	5	CO4	BT2	14.3.1
	10(B)	Write the notation used by the Einstein for the summation of $a_1x_1 + a_2x_2 + a_3x_3 + \dots + a_nx_n$ in tensor analysis. If $f = f(x^1, x^2, x^3, x^4, \dots, x^n)$ then show that $df = \frac{\partial f}{\partial x^l} dx^l$.	5	CO4	BT2	2.3.1, 5.4.1
***** END *****						



MANAV RACHNA UNIVERSITY

Deemed-to-be Private University under MHRD Act 2010 of 2014

DEPARTMENT OF MANAGEMENT "T3 Examination, Dec-2021"

SEMESTER	- III	DATE OF EXAM	13/12/2021
SUBJECT NAME	Basics of Economics	SUBJECT CODE	MCS 231
BRANCH	B.Ed, B.Sc. Physics, B.Sc. Mathematics	SESSION	Morning
TIME	9:00-10:30 am	MAX. MARKS	40
PROGRAM	BA B.Ed, B.Sc. Physics, B.Sc. Mathematics	CREDITS	2
NAME OF FACULTY	Srishti Bathla	NAME OF COURSE COORDINATOR	Srishti Bathla

R. S.
Signature

Q.NO.	QUESTIONS	MA RK S	CO ADD RESS ED	BLOOM'S LEVEL
Q1	Will the first slice of pizza give you the same amount of satisfaction/ utility as the third slice of pizza? Why/ Why not? Explain the law behind it with the help of example	5	CO1	L3
Q2	You bought some FMCG goods from the market worth Rs. 2000. Which type of market do these goods belong? What are the other types of markets in an economy? Distinguish between them with the help of some real-life examples	5	CO4	L3

Q3	What law of production applies in the long run? Explain the laws in detail	5	CO3	L2		
Q4	The Market Demand for a good at Rs. 10 per unit is 100 units. Due to increase in price, the market demand falls to 60 units. Find out the new price if the price elasticity of demand is (-)4.	5	CO2	L3		
Q5	What are the factors affecting the Supply of a commodity. Explain the factors with the help of examples.	5	CO4	L2		
Q6	The demand of 'salt' does not change with the change in its price. Why? Explain the reason with graphic representation.	5	CO2	L1		
Q7	Indian Economy is facing a fall in its GDP. What do you think must be reasons for the same? Comment.	5	CO1	L5		
Q8	Complete the table: (Fixed Cost is Rs. 100)					
Output	Total Variable cost	Marginal Cost	Total Cost	Average Fixed Cost	Average Variable cost	Average Total Cost
0	0					
1	60					
2	90					
3	110					
4	150					
5	230					
6	350					
7	510					
8	710					



MANAV RACHNA UNIVERSITY

Deemed as State Private University vide Haryana Act 26 of 2014

DEPARTMENT OF MANAGEMENT

"T3 Examination, Dec-2021"

SEMESTER	III	DATE OF EXAM	13/12/2021
SUBJECT NAME	INTRODUCTION TO FINANCE	SUBJECT CODE	MCS232
BRANCH	BBA, B Ed. GST	SESSION	MORNING
TIME	9:00-10:30 am	MAX. MARKS	40
PROGRAM	BBA, B Ed. GST	CREDITS	2
NAME OF FACULTY	DR. RASHI BANERJI/ DR. POOJA KAPOOR	NAME OF COURSE COORDINATOR	DR. RASHI BANERJI/ DR. POOJA KAPOOR

Page

Q.NO.	QUESTIONS	MAR KS	CO ADDRE SSED	BLOO M'S LEVE L
Q1(A)	Explain its features, merits and demerits of sole proprietorship?	5	CO1	L1
Q1(B)	Why banks are called financial intermediaries? What are the three roles of financial intermediaries?	5	CO1	L2
Q2(A)	Why analysis of financial statements is important? Give example/format of the three financial statements.	5	CO2	L1
Q2(B)	Explain the significance of Break Even Analysis with the help of a graph?	5	CO2	L2
Q3(A)	What are the differences between equity and preference capital? What is the cost of capital incurred through raising these capitals?	5	CO3	L3
Q3 (B)	Explain the advantages and disadvantages of raising capital from Debentures.?	5	CO3	L2
Q 4 (A)	Why the consideration of time value of money is important in financial decision making?	5	CO4	L3
Q4 (B)	What is the importance of capital budgeting decisions in long term decision making of a firm?	5	CO4	L3

DEPARTMENT OF MATHEMATICS
"T3 Examination, December-2021"

SEMESTER	FIFTH	DATE OF EXAM	08/12/2021
SUBJECT NAME	DIFFERENTIAL EQUATIONS	SUBJECT CODE	MAH319B
BRANCH	MATHEMATICS	SESSION	AFTERNOON
TIME	1:00PM-4:00PM	MAX. MARKS	100
PROGRAM	B.Sc.(B.Ed.)	CREDITS	4
NAME OF FACULTY	Dr Kalpana Shukla	NAME OF COURSE COORDINATOR	Dr Kalpana Shukla <i>Deepa</i>

Note: Note: Part A & Part B : All questions are compulsory.

Part C: Attempt any two questions.

Part D: Attempt any two questions.

Q.NO.	QUESTIONS	MAR KS	CO ADDRESSED	BLOOM'S LEVEL	PI
PART-A	1(A) Find the differential equation of the family of circles $(x - a)^2 + (y - b)^2 = 0$, where a, b are the constants.	2	C01	BT3	[2.1.2]
	1(B) Solve $(D^2 - 2D + 1)y = x^2 \sin x$	4	C01	BT3	[2.1.2]
	1(D) Solve $(x + 1)\frac{dy}{dx} - y = e^x(x + 1)^2$; $y(0)=4$.	4	C02	BT3	[2.1.1]
	1(E) Check the exactness, and find the solution $(e^x + 1)\cos x dx + e^x \sin x dy = 0$	3	C03	BT2	[2.1.2]
PART-B	Q2(A) State the application of differential equation in life science with suitable example.	2	C01	BT3	[1.1.1]
	2(C) Solve $xp + yq + x^2 + y^2 = 0$ Solve by direct integration;	2	C02	BT3	[2.1.2]
	2(D) $\frac{\partial^2 z}{\partial x \partial y} = e^{-y} \sin x$	2	C02	BT3	[2.1.1]

PART-C

	2(E)	State the equation of orthogonal trajectory.	2	C02	BT1	[1.1.1]
	Q3(A)	Solve $\frac{d^3y}{dx^3} = x \log x$ Solve $\frac{d^2y}{dx^2}(3-x) - (9-4x)\frac{dy}{dx} + (6-3x)y = 0$;	8	CO4	BT3	[2.3.1]
	Q3(B)	Given that $y = e^x$ is an integral included in the complimentary function.	12	C04	BT3	[3.1.2]
	Q4 (A)	Solve by method of variation of parameters: (i) $y'' + 3y' + 2y = e^{e^x}$ (ii) $\frac{d^2y}{dx^2} + y = \sec x$	20	C03	BT2	[4.1.1]
	Q5(A)	Solve $\frac{d^2y}{dx^2} - \frac{3}{2y} \left(\frac{dy}{dx}\right)^2 - 2y = 0$	12	CO3	BT4	[4.1.1]
	5(B)	Solve $y'' = (2y^3 - y)$ under the condition $y = 0, y' = 1$, when $x=0$.	8	C04	BT1	[2.1.1]
	Q6(A)	Solve $x(z^2 - y^2)p + y(x^2 - z^2)q = z(y^2 - x^2)$	12	CO3	BT3	[4.1.1]
	6(B)	Using the method of separation of variables, find the solution of the equation; $\frac{\partial u}{\partial x} - 2 \frac{\partial u}{\partial y} = 0; u(x, 0) = 2e^{-x}$	8	CO1	BT3	[2.1.1]
	Q7(A)	Find the complimentary function of the following: $D^2(5D'^2 + 9DD' + 4D'^2)u = 0$	8	C04	BT3	[2.1.3]
	7(B)	Solve $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} = \sin 2x \cos y$	12	C03	BT3	[1.1.2]
	Q8(A)	Solve $r + s - 6t = y \cos x$	10	C03	BT3	[2.1.2]
	8(B)	Solve $[D^3 + D^2D' - DD'^2 - D'^3]z = e^{2x} \sinh 2y$	10	CO3	BT3	[2.1.2]

***** END *****

DEPARTMENT OF MATHEMATICS
"T3 Examination, Dec-2021"

SEMESTER	V	DATE OF EXAM	06-12-2021
SUBJECT NAME	Linear Algebra	SUBJECT CODE	MAH302B
BRANCH	Mathematics	SESSION	II
TIME	1.00-4.00 PM	MAX. MARKS	100
PROGRAM	B.Sc.(H) Mathematics	CREDITS	4
NAME OF FACULTY	Mr. Ramapati Maurya	NAME OF COURSE COORDINATOR	Mr. Ramapati Maurya <i>Deepak</i>

Note: All questions are compulsory.

	Q.NO.	QUESTIONS	MARK S	CO ADDRESSED	BLOO M'S LEVEL	PI
PART-A	1(A)	Show That the set $\{x^3 - x + 1, x^3 + 2x + 1, x + 1\}$ is linearly independent in the vector space of all polynomials over the field of real numbers.	5	CO1	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
	1(B)	Find the co-ordinates of the vector $(5, -1, 2)$ with respect to the basis set $(1, 4, 2), (4, 2, 1), (2, 1, 3)$.	5	CO1	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
PART-B	2(A)	Suppose $T: \mathbb{R}^2 \rightarrow \mathbb{R}^3$ be a linear transformation defined by $T(x, y) = (x + 3y, 2x + 5y, 7x + 9y)$. Find the matrix of T with respect to the standard bases of \mathbb{R}^2 and \mathbb{R}^3 .	5	CO2	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
	2(B)	Find Range space ($R(T)$) and null space ($N(T)$) of the linear transformation $T: \mathbb{R}^2 \rightarrow \mathbb{R}^3$ defined by $T(x, y) = (x, x + y, y)$.	5	CO2	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1

PART-D

	Let T be linear operator on a vector space $V(F)$. If λ is an eigen value of T then prove that the eigen space V_λ is a subspace of $V(F)$.	7	CO3	BT4	PI 1.1.1 PI 2.1.1 PI 4.3.1
Q3(A)	Find the eigen values and the corresponding eigen space for the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. Is the linear transformation corresponding to the above matrix diagonalizable?	13	CO3	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
3(B)	Find a linear transformation which reduces the quadratic form: $2x_1^2 + 2x_2^2 + 3x_3^2 - 4x_2x_3 - 4x_1x_3 + 2x_1x_2$ to diagonal form.	10	CO3	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
Q4(A)	Prove that a quadratic form remains a quadratic form when subjected to linear transformation.	4	CO3	BT4	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
4(B)	Show that the quadratic form given by $x^2 + y^2 + z^2 + yz - zx - xy$ is positive definite.	6	CO3	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1
4(C)	Find the orthonormal basis using the Gram-Schmidt process to given subset $S = \{(1, 0, 1), (0, 1, 1), (1, 3, 3)\}$ of the standard inner product space \mathbb{R}^3 .	10	CO4	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1
Q5(A)	Let $V(F)$ be an inner product space. Then prove that $ \langle u, v \rangle \leq \ u\ \cdot \ v\ $ for all $u, v \in V$.	10	CO4	BT4	PI 1.1.1 PI 2.1.1 PI 4.3.1
5(B)	Suppose $u, v \in V$ are such that $\ u\ = 3$, $\ u + v\ = 4$, $\ u - v\ = 6$. What number does $\ v\ $ equal?	5	CO4	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
Q6(A)	Let V be a finite dimensional inner product space and W be a subspace of V , then prove that $V = W \oplus W^\perp$	8	CO4	BT4	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1
6(B)	Let $V(R)$ be a real inner product space. Let $u, v \in V$ such that $u \perp v$. Then show that $\ u + v\ ^2 = \ u\ ^2 + \ v\ ^2$. Also prove the converse.	7	CO4	BT3	PI 1.1.1 PI 2.1.1 PI 4.3.1 PI 4.1.1

END

DEPARTMENT OF MATHEMATICS

"T3 Examination, DEC-2021"

SEMESTER	V	DATE OF EXAM	09/12/2021
SUBJECT NAME	Numerical Analysis	SUBJECT CODE	MAH301B
BRANCH	BSc(H)Maths	SESSION	II
TIME	1:00PM-4:00PM	MAX. MARKS	100
PROGRAM	BSc(H)Maths	CREDITS	4
NAME OF FACULTY	Dr.Ruchi Gupta	NAME OF COURSE COORDINATOR	Dr.Ruchi Gupta <i>[Signature]</i>

Note: All questions are compulsory.

	Q.NO.	QUESTIONS	MA RKS	CO ADD RESS ED	BLO OM' S LEV EL	PI											
PART-A	1(A)	Find the polynomial for the following data. <table border="1"> <tr> <td>x</td> <td>-1</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>f(x)</td> <td>3</td> <td>12</td> <td>15</td> <td>-21</td> </tr> </table>	x	-1	1	2	3	f(x)	3	12	15	-21	5	CO1,C 03	BT2	1.1.1	
x	-1	1	2	3													
f(x)	3	12	15	-21													
B	By the method of least squares, find the parabola that best fits the following data: <table border="1"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>y</td> <td>1</td> <td>1.8</td> <td>1.3</td> <td>2.5</td> <td>6.3</td> </tr> </table>	x	0	1	2	3	4	y	1	1.8	1.3	2.5	6.3	5	CO1	BT2	1.1. 1.3.1. 1
x	0	1	2	3	4												
y	1	1.8	1.3	2.5	6.3												
PART-B	2	Find by Newton-Raphson method , the real root of the equation $3x = \cos x + 1$ correct to four decimal places.	10	CO2,C 03	BT3	1.1. 1.11. 1.1.1. 3.1.1											
	3(A)	Using Jacobi's method ,find all the eigen values and eigen vectors of the matrix $\begin{matrix} 2 & 3 & 1/\sqrt{2} \\ 3 & 2 & 1/\sqrt{2} \\ 1/\sqrt{2} & 1/\sqrt{2} & 5 \end{matrix}$	10	CO1,C 04	BT4	1.1.1. 11.1. 1.13. 1.1											
PART-C	(B)	Find the largest eigen value and the corresponding eigen vector of the matrix $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ using power method .Take $[1.0.0]^T$ as initial eigen vector.	10	CO5,C 04	BT4	1.1.1. 11.1. 1.13. 1.1											
	4(A)	Solve the equations by Gauss-Seidal Method : $\begin{aligned} 28x + 4y - z &= 32; x + 3y + 10z &= 24; 2x + 17y + 4z &= 35 \\ 3x + 2y + 7z &= 4; 2x + 3y + z &= 5; 3x + 4y + z &= 7 \end{aligned}$	10	CO3,C 04	BT3	1.1. 11.1. 1.13. 1.1											
	(B)	Apply LU Factorization Method to solve the equations:	10	CO3,C 04	BT4	1.1.1. 11.1. 1.13.											

1.1

1.1.1,
11.1.
1,13.
1.1

5(A) Using Runge-Kutta method of order 4, find y for $x=0.1, 0.2, 0.3$ given that $\frac{dy}{dx} = x^2 - y$, $y(0)=1$. Continue the solution at $x=0.4$ using Adams-Basforth method.

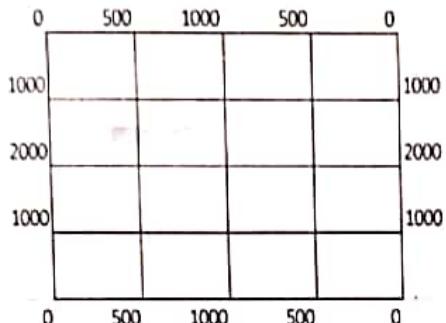
15 CO5,C
04 BT4

Apply Taylor's method obtain the approximation value of y for the differential equation $\frac{dy}{dx} = 2y + 3e^x$, given that $y=0$ when $x=0$.

5 CO5,C
04 BT41.1,
3.1.1

(B) Compare the numerical solution obtained with the exact solution.

Solve the elliptic equation $U_{xx} + U_{yy} = 0$ for the following square mesh with boundary values as shown:

1.1.1,
11.1.
1,13.
1.1

6

20 CO2,C
01 BT3

END

DEPARTMENT OF MATHEMATICS

"T3 Examination, Dec.-2021"

SEMESTER	V	DATE OF EXAM	13-12-21
SUBJECT NAME	Metric Spaces	SUBJECT CODE	MAH303B
BRANCH	Mathematics	SESSION	II
TIME	1:00-4:00 P.M	MAX. MARKS	100
PROGRAM	B.Sc.	CREDITS	4
NAME OF FACULTY	Dr. Advin Masih	NAME OF COURSE COORDINATOR	Dr. Advin Masih <i>Advin</i>

Note: Part A,B,C & D : All questions are compulsory.

	Q.NO.	QUESTIONS	MARKS	CO ADDRESSED	BLOOM'S LEVEL	PI
PART-A	1(A)	Let (X,d) be a metric space and $A \subset X$. Show that a point $x \in X$ is an adherent point of A if and only if $d(x,A) = 0$.	05	C01	BT2, BT3	1.1.1, 1.2.1, 3.1.2
	1(B)	Show that a closed set is nowhere dense if and only if its compliment is everywhere dense.	05	C01	BT2, BT3	1.1.1, 1.2.1, 3.1.2
PART-B	Q2(A)	Let $X = (0,1)$ and let $d(x,y) = x - y \forall x, y \in X$. Show that (X,d) is not complete.	05	C02	BT2, BT3	1.1.1, 1.2.1, 3.1.2
	2(B)	Let (X,d) be a complete metric space and Y be a subspace of X . Prove that Y is complete if and only if Y is closed.	05	C02	BT2, BT3	1.1.1, 1.2.1, 3.1.2
PART-C	Q3(A)	Show that a subset of R^n is compact if and only if it is closed and bounded.	10	C03	BT3	1.1.1, 1.2.1, 3.1.2
	3(B)	Prove that every closed subspace of a sequentially compact metric space is sequentially compact.	10	C03	BT3	1.1.1, 1.2.1, 3.1.2
	Q4(A)	Discuss the compactness of the metric space (R, d) , where d is usual metric.	10	C03	BT3, BT4	1.1.1, 1.2.1, 3.1.2

PART-D

4(B)	Prove that a metric space (X,d) is sequentially compact if and only if each sequence in X has a cluster point.	10	CO3	BT3	1.1.1, 1.2.1, 3.1.2
Q5(A)	Examine the connectedness of every line segment in R^3 .	10	CO4	BT4	1.1.1, 1.2.1, 3.1.2
5(B)	Show that continuous image of a connected set is connected.	10	CO4	BT3	1.1.1, 1.2.1, 3.1.2
Q6(A)	Show that the components of a totally disconnected space (X,d) are singleton subsets of X .	10	CO4	BT3	1.1.1, 1.2.1, 3.1.2
6(B)	Let (X,d) be a metric space and let A and B be two separated subsets of X . Show that A and B are closed sets if $A \cup B$ is closed.	10	CO4	BT3	1.1.1, 1.2.1, 3.1.2

***** END *****

DEPARTMENT OF COMPUTER SCIENCE & TECHNOLOGY

"T3 Examination, December -2021"

Semester: 5

Date of Exam: 02/12/21

Subject: Introduction to Database Management Systems

Subject Code: CSH321B-T

Branch: CSE

Session: II

Course Type: Core

Course Nature: Hard

Time: 3 Hours

Max.Marks: 100

Program: BSc. Mathematics

Signature: HOD/Associate HOD:

Note: All questions are compulsory.

PART -A



[10 marks]

S. No	Questions	Mark s	Course Outco mes	Bloom's Taxono my Level	Perform ance Indicato r
Q1	Define database management system and its applications?	5	CO1	1	1.4.1
Q2	What are database models? Compare and contrast the advantages and disadvantages of DBMS?	5	CO1	1	1.4.1
PART B [10 marks]					
Q3	Explain relation and their properties in details?	5	CO2	BT2	1.4.1
Q4	Consider the following schema: customer (c_name, street, city) Branch (B_name, city) Loan (loanno,b_name, amount) Account(account_no,B_name,balance)	5	CO2	BT3	1.4.1

	<p>Borrower (c_name, loanno) Depositor (c_name, accountno)</p> <p>Write the queries in tuple calculus</p> <ol style="list-style-type: none"> Find the loan number, branch, amount of loans of greater than or equal to 10000 amounts Find the loan number for each loan of an amount greater or equal to 10000. Find the names of all customers who have a loan and an account at the bank 			
--	--	--	--	--

PART - C

140 marks

S. No	Questions	Marks	Course Outcomes	Blooms Taxonomy Level	Performance Indicator
Q5	Explain the difference between super key, candidate and primary keys with example?	10	CO3	BT3	1.4.1
Q6	List the uses of functional dependencies also what are various functional dependencies rules?	10	CO3	BT3	1.4.1
Q7	List the decomposition properties. What are multivalued properties?	10	CO3	BT3	1.4.1
Q8	What is different type of Attributes and their representation?	10	CO3	BT3	1.4.1
	PART D				
	<u>140 marks</u>				
Q9	What is closed and frequent item sets in data mining?	10	CO5	BT5	1.4.1
Q10	What is preprocessing in data mining? Explain different data mining techniques?	10	CO4	BT4	1.4.1
Q11	What is Data Mining explain KDD process?	10	CO4	BT4	1.4.1
Q12	What is market basket Analysis? Explain Apriori algorithm?	10	CO5	BT5	1.4.1
