PAPER ID-411526

Roll No:

BTECH
(SEM III) THEORY EXAMINATION 2021-22
MATHEMATIVS-IV

Time: **3 Hours**   *Total Marks*: **100**

Instructions: Attempt the questions as per the given instructions. Assume missing data suitably.

Section – A

Attempt **all** parts in brief.   **2 x 10=20**

Q.1.	Question	Marks	CO.
(a).	Solve the following partial differential equation $(D^2 + DD')z = 0$.	2	1
(b).	Derive a partial differential equation by eliminating the constants a and b from $z = ax + a^2 y^2 + b$.	2	1
(c).	Write radio wave equations.	2	2
(d).	Classify the partial differential equation $u_{xx} + 3u_{xy} + u_{yy} = 0$	2	2
(e).	In an asymmetrical distribution mean is 16 and median is 20.Calculate the mode of the distribution.	2	3
(f).	The lines of regression of y on x and x on y are respectively $y = x + 5$ and $16x - 9y = 94$, Find the correlation coefficient.	2	3
(g).	Four persons are chosen at random from a group containing 3 men, 2 women and 4 children. Provethatthe chance that exactly two of them will be children is 10/21.	2	4
(h).	If the probability density functions $f(x) = \begin{cases} kx^3, & if\ 0 \le x \le 3 \\ 0, & elsewhere \end{cases}$, find the value of 'k'.Also, find the probability between $x = \frac{1}{2}\ and\ x = \frac{3}{2}$.	2	4
(i).	Explain t-test for "small samples".	2	5
(j)	What do you mean by statistical quality control (SQC)?	2	5

Section – B

Attempt **any three** parts ofthefollowing   **10 x 3 =30**

Q2.	Question	Marks	CO
(a).	Solve the partial differential equation $(D - D' - 1)(D - D' - 2) = \sin(2x + 3y)$	10	1
(b).	A laterally insulated bar of length has its ends A and B maintained at 0^0C and 100^0C respectively until steady state conditions prevail. If the temperature at B is suddenly reduced to 0^0C and kept so while that of A is maintained at 0^0C. Find the temperature at a distance x from A at any time t.	10	2
(c).	Calculate the first four central moments about the mean of the following data: <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>f</td><td>1</td><td>8</td><td>28</td><td>56</td><td>70</td><td>56</td><td>28</td><td>8</td><td>1</td></tr></table>	10	3
(d).	In a sample of 1000 cases, the mean of a certain test is 14 and S.D is 2.5. Assuming the distribution to be normal, find **(i)** How many students score between 12 and 15? **(ii)** How many score above 18? **(iii)** How many score below 8? *Given* $f(0.8) = 0.2881$, $f(0.4) = 0.1554$, $f(1.6) = 0.4452$, $f(2.4) = 0.4918$.	10	4
(e).	In an experiment on immunization of cattle from tuberculosis the following results were obtained: <table><tr><td></td><td>Affected</td><td>Unaffected</td></tr><tr><td>Inoculated</td><td>12</td><td>28</td></tr><tr><td>Not Inoculated</td><td>13</td><td>7</td></tr></table>Examine the effect of vaccine in controlling the incidence of the disease. [*Given* $\chi^2_{0.05,1} = 3.84$]	10	5

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	Section – C		
	Attempt **any one** part ofthefollowing	**10x 1 = 10**	
Q3.	**Question**	**Marks**	**CO**
(a).	Solve $(y + zx)p - (x + yz)q = x^2 - y^2$	10	1
(b).	Solve $(x^2 D^2 - 4xyDD' + 4D'^2 + 6D')z = x^3 y^4$.	10	1
	Attempt **any one** part ofthefollowing	**10x 1 = 10**	
Q4.	**Question**	**Marks**	**CO**
(a).	Solve the following partial differential equation by using method of separation of variables: $\frac{\partial z}{\partial x} + \frac{\partial^2 z}{\partial y^2} = 0;\ z(x,0) = 0,\ z(x,\pi) = 0, z(0,y) = 4\sin 3y.$	10	2
(b).	A string is stretched and fastened to two points l m apart. Motion is started by displacing the string in the form $u(x,0) = A\sin\frac{\pi x}{l}$ from which it is released at time t=0. Show that the displacement of any point at a distance x from one end at time t is given by $u(x,t) = A\sin\frac{\pi x}{l}\cos\frac{\pi ct}{l}$.	10	2
	Attempt **any one** part ofthefollowing	**10x 1 = 10**	
Q5.	**Question**	**Marks**	**CO**
(a).	Fit a parabolic curve of regression of $y\ on\ x$ to the following data:	10	3
(b).	Let the random variable X assume the value $'r'$ with the probability law $p(X = r) = q^{r-1}p;\ r = 1,2,3.....$ Find the m.g.f of X and hence it's mean and variance.	10	3
	Attempt **any one** part ofthefollowing	**10x 1 = 10**	
Q6.	**Question**	**Marks**	**CO**
(a).	Fit a binomial distribution for the following data and compare the theoretical frequencies with the actual ones	10	4
(b).	The number of accidents in a year involving taxi drivers in a city follows a Poisson distribution with mean equal to 3. Out of 1000 taxi drivers, find approximately the number of drivers such that i. No accident in a year ii. More than three accidents in a year. ($given,\ e^{-3} = 0.04979$).	10	4
	Attempt **any one** part ofthefollowing	**10x 1 = 10**	
Q7.	**Question**	**Marks**	**CO**
(a).	In two independent sample of size 8 and 10, the sum of square of deviations of the sample values from the respective means were 84.4 and 102.6. Test whether the difference of variances of populations is segment or not. Use a 5% level of significance. $[F_{0.05,(7,9)} = 3.29]$	10	5
(b).	An inspection of 10 samples of size 400 each from 10 lots revealed the following number of defective units: 17, 15, 14, 26, 9, 4, 19, 12, 9, 15.Draw the np -charts and state whether the proces is under control or not.	10	5

Q5 (a) data table:

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

Q6 (a) data table:

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