PAPER ID-310894

Roll No:

B TECH
(SEM-III) THEORY EXAMINATION 2020-21
MATHEMATICS-IV

Time: 3 Hours   *Total Marks: 100*
Note: **1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. **Attempt *all* questions in brief.** $2 \times 10 = 20$

Q no.	Question	Marks	CO
a.	What is the auxiliary equation of Charpit Method?	2	1
b.	Solve $z = px + qy + \sqrt{1 + p^2 + q^2}$	2	1
c.	Classify the following Partial Differential Equation $4\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x \partial t} + \frac{\partial^2 u}{\partial t^2} = 0$	2	2
d.	Explain the Radio Equations.	2	2
e.	The first two moments of a distribution about the value '2' of the variable are 1,16. Show that mean is 3, variance is 15.	2	3
f.	If the regression coefficient is 0.8 and 0.2, What will be the value of coefficient of Correlation.	2	3
g.	If the function f(x) is defined by $f(x) = ce^{-x}, 0 < x < \infty$ calculate the value of c which changes f(x) to a probability density function.	2	4
h.	Identify the following statement is true or false "For a Binomial Distribution, mean is 6 and variance is 9.	2	4
i.	When is the test statistic $F = \frac{S_1^2}{S_2^2}$ is used?	2	5
j.	Explain the t-test for small samples.	2	5

SECTION B

2. **Attempt any *three* of the following:** $3 \times 10 = 30$

a.	Solve $x^2 \frac{\partial^2 z}{\partial x^2} + 2xy\frac{\partial^2 z}{\partial x \partial y} + y^2 \frac{\partial^2 z}{\partial y^2} = x^m y^n$.	10	1
b.	Calculate the deflection u(x,t) of a tightly stretched vibrating string of unit length that is initially at rest and whose initial position is given by $sin\pi x + \frac{1}{3} sin3\pi x + \frac{1}{5} sin5\pi x, \quad 0 \leq x \leq 1$	10	2
c.	Use the Method of Least Squares, find the curve $y = ab^x$ that best fits the following data: <table><tr><td>x</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>8.3</td><td>15.4</td><td>33.1</td><td>65.2</td><td>127.4</td></tr></table>	10	3
d.	State Baye's Theorem. The contents of urns I, II and III are as follows:1 white,2 black and 3 red balls; 2 white, 1 black and 1 red balls; 4 white, 5 black and 3 red balls. One urn is chosen at random and two balls drawn. They happen to be white and red. What is the probability that they come from urn I?	10	4
e.	From the following table regarding the color of eyes of father and son, test if the color of son's eye is associated with that of father. <table><tr><td rowspan="2">Eye color of father</td><td colspan="2">Eye color of son</td></tr><tr><td>Light</td><td>Not Light</td></tr><tr><td>Light</td><td>471</td><td>51</td></tr><tr><td>Not Light</td><td>148</td><td>230</td></tr></table> Given $\chi^2_{0.05}(1) = 3.841$	10	5

SECTION C

3. **Attempt any *one* part of the following:**

Q no.	Question	Marks	CO
a.	Solve the Partial Differential Equation: $D (D + D' - 1) (D + 3D' - 2)z = x^2 - 4xy + 2y^2$.	10	1
b.	Solve : $(x^2 - y^2 - yz)p + (x^2 - y^2 - zx)q = z(x - y)$.	10	1

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4. **Attempt any *one* part of the following:**

Q no.	Question	Marks	CO
a.	A rod of length l with insulated sides is initially at a uniform temperature u_0. Its ends are suddenly cooled to 0^0C and are kept at that temperature. Calculate the temperature function $u(x,t)$.	10	2
b.	Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the boundary conditions, $u(0,y) = u(l,y) = u(x,0) = 0$ and $u(x,a) = sin\frac{n\pi x}{l}$	10	2

5. **Attempt any *one* part of the following:**

Q no.	Question	Marks	CO
a.	Calculate the moment generating function of the discrete Binomial Distribution given by P(x)= $^nC_x p^x q^{n-x}$ where (q=1-p).Also find the first and second moments about the mean.	10	3
b.	The following table gives age (x) in years of cars and annual maintenance cost (y) in hundred rupees.	10	3

x	1	3	5	7	9
y	15	18	21	23	22

Calculate the maintenance cost for a 4-year-old car after finding the regression equation.

6. **Attempt any *one* part of the following:**

Q no.	Question	Marks	CO
a.	Show that Poisson Distribution is a particular limiting form of the Binomial Distribution when p or q is very small, and n is large enough.	10	4
b.	A sample of 100 dry battery cells tested to find the length of life produced the following results:$\bar{x}$=12 hours, σ=3 hours. Assuming the data to be normally distributed, what percentage of battery cells are expected to have life (i) more than 15 hours (ii) less than 6 hours (iii) between 10 and 14 hours.	10	4

7. **Attempt any *one* part of the following:**

Q no.	Question	Marks	CO
a.	It is desired to compare three hospitals with regards to the number of deaths per month. A sample of death records were selected from the records of each hospitals and number of deaths was as given below. From mentioned data, determine the difference in the number of deaths per months among three hospitals:	10	5

Hospitals

A	B	C
3	6	7
4	3	3
3	3	4
5	4	6
0	4	5

(Given: at 5% level of significance, $F_{2,12}$=3.89)

Q no.	Question	Marks	CO
b.	Distinguish between the np-chart and p-chart. Following is the data of defective of 10 samples of size 100 each. Construct np chart and examine whether the process is in statistical control?	10	5

Sample no.	1	2	3	4	5	6	7	8	9	10
No. of defectives	6	9	12	5	12	8	8	16	13	7