

FACULTY OF ENGINEERING

B.E. (Civil/Mech./Prod./AE) III - Semester (AICTE) (Main & Backlog) (New) Examination,
February/ March 2024

Subject: Mathematics-III

Time: 3 Hours

Max. Marks: 70

Note: (i) First question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 Marks.

(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.

(iii) Missing data, if any, may be suitably assumed.

1. (a) Form a partial differential equation by eliminating arbitrary constants a and b from $2z = (ax + y)^2 + b$.

(b) Classify the partial differential equation $\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = 0$.

(c) Find the mean of uniform distribution.

(d) If $y = a + bx$, $\sum x = 15$, $\sum y = 30$, $\sum xy = 110$ and $\sum x^2 = 55$, then find the value of a .

(e) Write any two applications of χ^2 - test.

(f) Solve $p^2 + q^2 = 1$.

(g) Define normal distribution.

2. (a) Solve $pz - qz = z^2 + (x + y)^2$.

(b) Solve $p^2 - q^2 = x - y$.

3. The vibrations of an elastic string is governed by the partial differential equation $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$.

The length of the string is π and the ends are fixed. The initial velocity is zero and the initial deflection is $u(x, 0) = 2(\sin x + \sin 3x)$. Find the deflection $u(x, t)$ of the vibrating string for $t > 0$.

4. (a) Fit a Poisson distribution for the following data and calculate the expected frequencies.

x	0	1	2	3	4	5
f	42	33	14	6	4	1

(b) Find the second and fourth moments about mean for the data 2, 3, 7, 8, 10.

5. (a) Compute rank correlation coefficient for the following data.

x	1	2	3	4	5	6	7	8	9	10
y	2	4	1	5	3	9	7	10	6	8

- (b) The mean life time of a sample of 100 light tubes produced by a company is found to be 1560 hours with a population standard deviation of 90 hours. Test the hypothesis that the mean life time of the tubes produced by the company is 1580 hours at 5 % level of significance.

6. Two independent samples of 8 and 7 items respectively had the following values.

Sample A :	9	11	13	11	16	10	12	14
Sample B :	11	13	11	14	10	8	10	—

Do the estimates of the population variance differ significantly? Test at 5 % level of significance.

7. (a) Solve $z = px + qy + pq$ by Charpit's method.

(b) If X is normally distributed with mean 2 and variance 0.1, then find $P(|X - 2| \geq 0.01)$.

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