

FACULTY OF ENGINEERING

B.E. CSE (AI&DS) / CSE (AI / AI&ML) III - Semester (AICTE) (Main & Backlog) (New) Examination,
February/ March 2025

Subject: Mathematics-III / Mathematics-III (P&S)

Time: 3 Hours

Max. Marks: 70

Note: (i) First question is compulsory and answer any four questions from the remaining six questions. Each questions 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) State and prove addition theorem on probability.
- b) Show that the mean and variance of Poisson distribution are same.
- c) If X is uniformly distributed with mean 1 and variance $\frac{4}{3}$, then find $P(X < 0)$.
- d) Find a straight line of the form $y = a + bx$ to the following data.

x	-1	2	3
y	6	21	30

- e) State any two applications of χ^2 - test.
 - f) Show that the correlation coefficient r is the geometric mean between the two regression coefficients.
 - g) Define exponential distribution and find its mean.
2. a) State and prove Bayes' theorem.
 - b) A party of 25 person take their seats at random at a round table. Find the probability that two specified person do not sit together.
3. a) Define binomial distribution. Find its mean, variance and Skewness.
 - b) The probability that a bomb dropped from a plane will strike the target is $\frac{1}{5}$, If six bombs are dropped, find the probability that (i) exactly two will strike the target (ii) at least two will strike the target.
4. In a test on 2000 electric bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and SD of 60 hours. Estimate the number of bulbs likely to burn for
 - (a) more than 2150 hours
 - (b) less than 1950 hours and
 - (c) more than 1920 hours and but less than 2160 hours.

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5. a) Using the method of least squares, fit a curve of the form $y = ax^b$ to the following data.

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

- b) Find the correlation coefficient between x and y from the following data.

x	92	89	87	86	83	77	71	63	53	50
y	86	88	91	77	68	85	52	82	37	57

6. Eleven school students were given a test in drawing. They were given a month's further tuition and a second test of equal difficulty was held at the end of it. Do the marks give the evidence that the students have benefited by extra coaching.

Students	1	2	3	4	5	6	7	8	9	10	11
Marks in Test I	23	20	19	21	18	20	18	17	23	16	19
Marks in Test II	24	19	22	18	20	22	20	20	23	20	17

(Test at 5% level of significance).

7. a) State any two applications of R – charts.
b) Find the rank correlation coefficient for the following data which shows the marks obtained by a student in two exams X and Y .

X	6	5	8	8	7	6	10	4	9	7
Y	8	7	7	10	5	8	10	6	8	6

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FACULTY OF ENGINEERING

Code No: 11009/BL

B.E. 2/4 (Civil) I – Semester (Backlog) Examination, May/June 2019

Subject: Mathematics – III (Common to All Except I.T.)

Time: 3 Hours

Max. Marks: 75

Note: Answer all questions from Part A and Five questions from Part B.

PART – A (10x2 = 20 Marks)

- 1) Eliminate the arbitrary constants a, b to obtain a partial differential equation from $z = ax + by^2 - axy$ 3
- 2) Find the singular integral of $z = px + qy - p^2q$ 2
- 3) Find the Half range cosine series of the function $f(x) = \pi - x^2$ for $0 < x < \pi$ 3
- 4) State the principle of superposition. 2
- 5) Seven students are to sit at one side of a straight table. Find the probability of two particular students sitting together. 3
- 6) A continuous random variable 'x' has the probability density function $f(x) = \begin{cases} ke^{-\frac{x}{4}} & , x \geq 0 \\ 0 & \text{otherwise} \end{cases}$, then find the value of k. 2
- 7) State any two applications of χ^2 -distribution. 3
- 8) Define Gamma distribution and find its mean. 2
- 9) Fit a straight line of the form $y = a + bx$ to the following data 3

x:	-2	1	4	7
y:	-1	4	9	14

- 10) Prove that the arithmetic mean of the coefficients of regression is greater than the coefficient of correlation. 2

PART – B (50 Marks)

11. a) Solve $p + 8q = 5z + \tan(y - 3x)$. 5
- b) Find a complete integral of $2(z + xp + yq) = yp^2$ by using Charpit's method. 5

contd. 2

12. Find the Fourier series of the function $f(x) = x + \frac{x^2}{4}$, $-\pi \leq x \leq \pi$. Hence deduce that

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12} \quad 10$$

13. Find the solution of the Heat equation $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$ subject to the boundary condition $u(0,t) = u(1,t) = 0$ and $u(x,0) = x$ (here $t > 0$). 10

14. Box A contains 2000 bulbs of which 8% are defective and box B contains 1000 bulbs of which 12% are defective. Two bulbs are picked selectively from a randomly select box. Then

- (i) Find the probability that both bulbs are defective.
(ii) Assuming that both bulbs are defective, find the probability that they came from box B. 10

15. A number of candidates appeared to a selection trial for recruitment in the army. A random sample of heights of 10 candidates are 162 cm, 170 cm, 168 cm, 169 cm, 173 cm, 171 cm, 165 cm, 166 cm, 161 cm, and 160 cm, can be conclude that the average height of the candidates is greater than 165 cm? Test at 5% level of significance. [$t(0.1)$ for two tailed test is 1.833] 10

16. a) Using the method of least squares, fit a parabola $y = a + bx + cx^2$ to the data

x	0	1	2	3	4
y	1	0	3	10	21

- b) Find the lines of regression for the following data 10

x	6	2	10	4	8
y	9	11	5	8	7

17. a) Find a complete integral of $x^2 p^2 + y^2 q^2 = z^2$ 5
b) Find the moment generating function of Poisson distribution. 5
