

OSMANIA UNIVERSITY
FACULTY OF ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING (AUTONOMOUS)
B.E. (CIVIL & MINING) III-Semester (Main) Examinations January/February 2023

MATHEMATICS - III (PDE & PROBABILITY)

Time : 3 hours

Max. Marks : 70

- Note : i) Answer **Question No. 1** (Compulsory) and Answer any **four questions** from the remaining questions (2- 7).
ii) Answers must be written in same order as they occur in the Question Paper.
iii) Missing data, if any, may suitably be assumed.

	Marks	BT	CO
1. a) Write Heat Equation in One Dimensional and Two Dimensional.	2	4	1
b) Write Normal Equations of Parabola.	2	2	2
c) Define expectation for discrete and continuous random variables.	2	5	3
d) If a Poisson distribution is such that $p(x=1) \cdot \frac{3}{2} = p(x=3)$ then find $p(x \geq 1)$	2	1	4
e) Given $n=10$, $\sigma_x=5.4$, $\sigma_y=6.2$ and sum of the Product of deviation from the mean of X and Y is 66. Find the Correlation Coefficient.	2	6	5
f) Explain the Method of least squares.	2	2	5
g) Find the Moment Generating function of a Normal distribution.	2	5	4
2. a) Solve the differential equation $2yzp + xzq = 3xy$	7	1	1
b) Solve : $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = x + y$	7	4	1
3. a) Find the solution of the one dimensional heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ where $u(0,t)=0$, $u(l,t)=0$ and $u(x,0)=x$ ($0 < x < l$) l being the length of the rod	10	3	2
b) Solve the differential equation $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$, where $u(x,0) = 4e^{-x}$ by the Method of Separation of Variables.	4	2	2

4. a) Calculate the first four moments of the following distribution about the mean : 8 1 3

x :	0	1	2	3	4	5	6	7	8
f :	1	8	28	56	70	56	28	8	1

Also evaluate β_1 and β_2

- b) The density function of a random variable X is 6 3 3
 $f(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$ Then Find $E(X)$, $E(X^2)$ and $\text{Var}(X)$

5. a) Find the mean and variance of the binomial distribution. 8 6 4

- b) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and variance of the distribution. 6 5 4

6. a) The two regression line equations of the variables x and y are $x = 19.13 - 0.87y$ and $y = 11.64 - 0.50x$, Find i) means of x and y ii) the correlation coefficient between x and y . 7 2 5

- b) Find straight line equation for the following data 7 1 5

X:	1	2	3	4	5
Y:	14	27	40	55	68

7. a) If θ is the angle between two regression lines and S.D of Y is twice the S.D of X and $r = 0.25$, find $\tan\theta$ 4 4 5

- b) The ranks in two subjects are given below. Find the rank correlation coefficient 10 6 5

Rank in x :	5	2	8	1	4	6	3	7
Rank in y :	4	5	7	3	2	8	1	6

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