# FACULTY OF ENGINEERING
## B.E. III - Semester (AICTE) (Main & Backlog) Examination, July 2021

### Subject: Mathematics – III (PDE, P & S)

Time: 2 Hours                                                                          Max. Marks: 70

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

## PART – A

**Note: Answer any five questions.**                                         **(5x2 = 10 Marks)**

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

2  Solve $p \tan x + q \tan y = \tan z$.

3  Classify the partial differential equation $\dfrac{\partial^2 u}{\partial x^2} + 2\dfrac{\partial^2 u}{\partial y^2} = 0$.

4  Apply the method of separation of variables to solve $u_x = u_y$.

5  If a random variable X is uniformly distributed over $(-a, a)$, find 'a' so that $P(X>1) = \dfrac{1}{3}$.

6  Find the first moment $\mu_1$ about mean of the series 3,6,8,10,18.

7  Write normal equations to fit a curve of the form $y = a + bx + cx^2$.

8  Prove that the correlation coefficient is the geometric mean of regression coefficients.

9  Write the test statistic t to test of significance for single mean of small sample.

10  Write uses of F-test.

## PART – B

**Note: Answer any four questions.**                                         **(4x15 = 60 Marks)**

11 (a) Solve $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$.

   (b) Solve $pxy + pq + qy = yz$ by Charpit's method.

12 Solve the Laplace equation $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0$ for a rectangular plate subject to the conditions

$u(0, y) = 0, \ u(a, y) = a - y, \ \dfrac{\partial u}{\partial y}(x,0) = 0, \ \dfrac{\partial u}{\partial y}(x, a) = 0$.

13 (a) In a normal distribution, 31% of the items are under 45 and 8% of the items are over 64. Find the mean and standard deviation of the distribution.

   (b) Define uniform distribution. Find the moment generating function of uniform distribution.

14 (a) Compute the rank correlation coefficient from the following data:

| $x$ : | 85 | 60 | 73 | 40 | 90 |
|-------|----|----|----|----|----|
| y: | 93 | 75 | 65 | 50 | 80 |

   (b) The heights of a college students in a city are normally distributed with standard deviation 6 cms. A sample of 100 students have mean height 158 cms. Test the hypothesis at 5% level of significance that the mean height of college students in the college is 160 cms.

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15 Fit a Poisson distribution for the following data and test the goodness of fit at 5% level of significance.

| $x$ : | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| y: | 110 | 170 | 130 | 60 | 23 | 7 |

16 (a) Solve $p^2 + q^2 = z$ .

(b) Find the solution of the heat equation $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 y}{\partial x^2}$ subject to the conditions $u(0,t) = u(l,t) = 0$, $u(x,0) = T$ (constant temperature), $0 < x < l, t > 0$ .

17 (a) The observations from an experiment are as given below:

| y: | 350 | 400 | 500 | 600 |
|---|---|---|---|---|
| $x$ : | 61 | 26 | 7 | 2.6 |

If y and $x$ are connected by the relation $y = ax^b$ , find the best possible values of a and b.

(b) Find the students t for the following variable values in a sample of eight, taking the mean of the universe to be zero.

-4, -2, -2, 0, 2, 2, 3, 3.

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