Roll No. ....

OLE-3057

B. Tech. 3rd Semester (ME)

Examination – April, 2021

MATHEMATICS- III (PDE, PROBABILITY & STATISTICS)

Paper : BSC-ME-203-G

Time : Three Hours] *[Maximum Marks : 75*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Question No. **1** is ***compulsory***. Attempt total ***five*** questions with selecting ***one*** question from each Unit. All questions carry equal marks.

1. (a) Solve the P. D. E. $(px+qy-z)^3 = \frac{1}{pq}$.

(b) Define initial and boundary conditions.

(c) Define discrete and continuous probability distribution.

(d) A Random variable X has the following probability distribution :

x	–2	–1	0	1	2	3
$P[X = x]$	0.1	K	0.2	$2K$	0.3	K

Find value of K.

(e) Define Type-I Error and Type-II Error in sampling.

(f) What do you mean by correlation coefficient ?

UNIT – I

2. (a) Formulate the Partial differentiation Equation by eliminating the arbitrary function :

(i) $z = f(x+ay)+g(x-ay)$

(ii) $z = ax+by+(a^2+b^2)$

(b) Solve the P. D. E. $p+3q = 5z+\tan(y-3x)$

3. (a) Solve the Homogenious linear P. D. E. $(D^2+2DD'+D'^2)\,z = e^{2x+3y}$, where $D \cong \frac{\partial}{\partial x}$ and $D' \cong \frac{\partial}{\partial y}$.

(b) Solve the Non homogenious linear P. D. E. $\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial x \partial y}+\frac{\partial z}{\partial y}-z = \sin\,(x+2y)$.

UNIT – II

4. (a) Obtain the general solution of Heat flow Equation $k\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ by method of separation of variables.

(b) Obtain the general solution of wave equation $\frac{\partial^2 u}{\partial x^2}=\frac{1}{c^2}\frac{\partial^2 u}{\partial z^2}$.

5. An insulated rod of length l has its ends A and B maintained at 0°C and 100°C respectively until steady state conditions prevails. If B is suddenly reduced to 0°C and maintained at 0°C, find the temperature at a distance x from A at time t.

UNIT – III

6. (a) In a bolt factory, machines A, B and C manufactures 25%, 35% and 40% of the total of their output 5%, 4% and 2% are defective bolts. A bolt is drawn at random from product and is found to be defective. What are the probabilities that it was manufactured by machine A, B or C ?

(b) Define the Normal Probability distribution and standard Normal distribution. Also discuss same characteristics of Normal distribution.

7. (a) Define Binomial and Poisson distribution along with physical conditions. Also show that mean and variance are equal in Poission distribution.

(b) Given a table of value for the function as :

x	1.0	1.5	2.0	2.5	3.1	4.0
y	1.1	1.3	1.6	2.0	3.4	4.2

Fit a second degree Polynomial.

UNIT – IV

8. (a) The 9 items of a sample have the following values 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these values differ significantly from the assumed mean 47.5.

(b) The joint probability distribution of X and Y is given below :

$Y \backslash X$	-1	1
0	$\frac{1}{8}$	$\frac{3}{8}$
1	$\frac{2}{8}$	$\frac{2}{8}$

Find the correlation coefficient between X and Y.

9. (a) A set of 5 coins is tossed 3200 times and the number of heads appearing each time is noted. The result are given below :

No. of heads	0	1	2	3	4	5
Frequency	80	570	1100	900	500	50

Test the hypothesis that coins are unbiased.

(b) Describe the measure of Skewness and Kurtosis. Also calculate the first four moments of the following distribution about the mean and hence find β_1 and β_2.