No. of Printed Pages : 03 **Roll No. .....**

18C31

B. Tech. EXAMINATION, 2021

(Third Semester)

(C-Scheme) (Main Only)

(ME)

MATH201C

MATHEMATICS-III

Time : 2½ *Hours*] [*Maximum Marks :* 75

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

Note : Attempt *Four* questions in all. All questions carry equal marks.

1. (a) Solve the differential equation $py + qx = xyz^2\left(x^2 - y^2\right)$.

(b) Examine whether the system of partial differential equations are compatible or not ? If compatible, find the solution of :

(i) $\frac{\partial z}{\partial x} = 5x - 7y, \frac{\partial z}{\partial y} = 6x + 8y$

(ii) $\frac{\partial z}{\partial x} = \left(x + y\right)^2, \frac{\partial z}{\partial y} = x^2 + 2xy - y^2$

2. (a) Find the complete integral of $z^2\left(p^2 + q^2\right) = x^2 + y^2$.

(b) Solve :

$$\left(\mathrm{D}^3 - 4\mathrm{D}^2\mathrm{D}' + 4\mathrm{D}'^2\mathrm{D}\right)z = \cos\left(2x + y\right)$$

3. Show that the solutions of one-dimensional wave equation $\frac{\partial^2 u}{\partial x^2} = \frac{1}{C^2}\frac{\partial^2 u}{\partial t^2}$ are of the form A $\exp(\pm ipx \pm ipct)$, where A and P are constants.

4. Obtain the solution of wave equation $\frac{\partial^2 u}{\partial x^2} = \frac{1}{C^2}\frac{\partial^2 u}{\partial t^2}$ subjected to boundary conditions $u(0, t) = u(0, t) = 0$, $t > 0$ and initial conditions $u(x, 0) = f(x)$, $0 \leq x \leq a$ and $\left(\frac{\partial u}{\partial t}\right)_{t=0} = g(x)$.

5. (a) Given the median values is 46, find the missing frequencies for the following incomplete frequency distribution :

Class	:	10-20	20-30	30-40	40-50	50-60	60-70	70-80
f	:	12	30	—	65	—	25	18

Total frequency = 229.

(b) Determine the Pearson's coefficient of skewness for the data given below :

Class	:	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
f	:	5	9	14	20	25	15	8	4

6. (a) Find the equation of lines of regression based on the following data :

x	:	4	2	3	4	2
y	:	2	3	2	4	4

(b) Out of 800 families with 5 children each, how many families would be expected to have :

(i) 3 boys and 2 girls

(ii) 2 boys and 3 girls

(iii) One girl

(iv) At the most two girls, under the assumption that probabilities of boys and girls are equal.

7. (a) Define Probability. In a single throw of two distinct dice, what is the probability of obtaining :

(i) a total of 7 ?

(ii) a total of 13 ?

(iii) a total even number.

(b) What are independent events ? A problem in mathematics is given to three students whose chances of solving the problem are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$. What is the probability that the problem is solved ?

8. (a) A die is tossed thrice. A success is 'getting 1 or 6' on a toss. Find the mean and variance of the number of successes.

(b) Write a short note on correlation coefficient. Calculate the covariance and the coefficient of correlation between X and Y, if $n = 10$, $\sum x = 60$, $\sum y = 60$, $\sum x^2 = 400$, $\sum y^2 = 580$ and $\sum xy = 305$.