

**Roll No.**

**Total No. of Pages : 02**

**Total No. of Questions : 09**

**B.Tech. (Automation & Robotics)/ (CSE)/ (Electrical & Electronics Engineering)/ (EE)/ (ECE)/ (Electronics & EE) (Sem-2)**

## MATHEMATICS-II

**Subject Code : BTAM202-18**

**M.Code : 91958**

**Date of Examination : 13-06-2023**

**Time : 3 Hrs.**

**Max. Marks : 60**

**INSTRUCTIONS TO CANDIDATES :**

1. SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. SECTION - B & C. have **FOUR** questions each.
3. Attempt any **FIVE** questions from SECTION B & C carrying **EIGHT** marks each.
4. Select atleast **TWO** questions from SECTION - B & C.

## SECTION-A

**1. Solve :**

- For the differential equation  $\{e^{2y} + 1\} \cos x \, dx + 2e^{2y} \sin x \, dy = 0$ , check whether the equation is exact or not.
- Find the general solution of the first order linear differential equation  $y' + y = \sin x$ .
- Find the general solution of the Clairaut's equation  $y = xy' - (1/y')$ .
- Find the general solution of the differential equation  $y'' + 8y' - 9y = 0$ .
- Find the solutions of the homogeneous partial differential equation:

$$\left[ 2D^2 + 5DD' + 3(D'')^2 + D + D' \right] z = 0, \text{ where } z = f(x, y).$$

- f) Find an interval which contains the root of the equation:  $x^{\text{ex}} - 1 = 0$ .
- g) Construct the forward difference table for the data

|        |     |    |   |    |    |     |
|--------|-----|----|---|----|----|-----|
| $x$    | -4  | -2 | 0 | 2  | 4  | 6   |
| $f(x)$ | -67 | -9 | 1 | 11 | 69 | 223 |

- h) What is Trapezoidal rule. Give its formula.
- i) Write down Laplace equation in two variables.
- j) State Milne's Predictor-Corrector method.

### SECTION-B

2. a) Solve the initial value problem  $(\cos x + y \sin x)dx - (\cos x)dy, y(\pi) = 0$ .  
 b) Find the solution of the Bernoulli equation  $xy' = (y^2 - 1)/y$ .
3. Find the general solution of the differential equation  $y'' + 4y = \cos x$ , using the method of variation of parameters.
4. Find the general solutions of the partial differential equation:  
 $[6D^2 + 5DD' - 6(D')^2]z = 132 \log(x + 3y)$ .
5. Find the complete integral of the partial differential equation  $p^2 - 3q^2 = 5$ .

### SECTION-C

6. Perform three iterations of the Newton-Raphson method to find a root of the equation  $xe^x - 1 = 0$ , which is close to 0.5.
7. Evaluate  $\int_1^2 \frac{x^2}{1+x^3} dx$  using the Simpson's 1/3rd rule with four sub-intervals. Compare with the exact solution.
8. Solve the initial value problem  $y' = x(y - x)$ ,  $y(2) = 3$  in the interval  $[2, 2.4]$  using the classical Runge-Kutta fourth order method with the step size  $h = 0.2$ .
9. In the initial value problem  $y' = xy + x^2y^2 + 1$ ,  $y(1) = 2$ ,  $h = 0.1$ ,  $x \in [1, 1.3]$ , find the approximate values of  $y(x)$  at the given point using the Euler method.

**NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.**