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 :**

a) For the differential equation $(e^{2y} + 1) \cos x \, dx + 2e^{2y} \sin x \, dy = 0$, check whether the equation is exact or not.

b) Find the general solution of the first order linear differential equation $y' + y = \sin x$.

c) Find the general solution of the Clairaut's equation $y = xy' - (1/y')$.

d) Find the general solution of the differential equation $y'' + 8y' - 9y = 0$.

e) 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: $x^{ex} - 1 = 0$.

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 $\int_1^2 \dfrac{x^2}{1+x^3}\,dx$ 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**.