B.Tech. (Sem.–2)

MATHEMATICS-II

Subject Code : BTAM-202-18

M.Code : 91958

Date of Examination : 23-01-2023

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. a) Find the integrating factor of differential equation: $(x^2 + y^2 + x)\, dx + xy\, dy = 0; x > 0$.

    b) Solve the differential equation: $x^2\left(\dfrac{dy}{dx}\right)^2 + xy\dfrac{dy}{dx} - 6y^2 = 0$.

    c) Define homogeneous linear differential equation with constant coefficients.

    d) Find the differential equation of all spheres of fixed radius having centres in xy - plane.

    e) Solve the lagrange's equation: $p + q = 0$.

    f) Classify the differential equation: $\dfrac{\partial^2 y}{\partial t^2} = c^2 \dfrac{\partial^2 y}{\partial x^2}$.

    g) What are the advantages of Regula Falsie method?

    h) What is the relation between ∇ and E ?

i) What is Simpson's $\frac{1}{3}$ - rule?

j) State Euler's modified iteration formula.

SECTION-B

2. Solve $y''' - y'' + 4y' - 4y = \sin 3x$.

3. Solve the differential equation $(1 - x^2)\dfrac{d^2 y}{dx^2} - 2x\dfrac{dy}{dx} + 2y = 0$.

4. Solve the following Lagrange's partial differential equation :

   $(y + z)\,p + (z + x)\,q = (x + y)$

5. Solve the equation $p^2 = q + px$ Charpit's method.

SECTION-C

6. Use bisection method to solve the equation $x^3 + x^2 + x + 7 = 0$ correct to three decimal places.

7. Given that $\displaystyle\sum_{11}^{20} f(x) = 44060,\ \sum_{14}^{20} f(x) = 38220,\ \sum_{17}^{20} f(x) = 27178,$ and $f(20) = 8450.$
   Find the value of $f(11)$.

8. Solve the initial value problem $y' = x(y - x)$, $y(2) = 3$ in the interval $[2 , 24]$ using the classical Runge-Kutta fourth order with step size $h = 0.2$.

9. Tabulate the solution of $\dfrac{dy}{dx} = x + y$, $y\,(0) = 0$ for $0.4 \le x \le 1.0$ with $h = 0.1$ using Predictor Corrector formula.

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.