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Total No. of Pages: 02

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**B.Tech All (Sem. – 2)**

**MATHEMATICS-II**

**Subject Code: BTAM-202-18**

**M Code: 76255**

**Date of Examination : 23-01-23**

**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, carrying EIGHT marks each.
3. **Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.**

**SECTION-A**

1. Answer the following:

- a) Is this differential equation  $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^3 = \left(\frac{d^2y}{dx^2}\right)^2$  linear?
- b) Is this differential equation  $3e^x \tan y dx + (1 - e^x) \sec^2 y dy = 0$  exact ?
- c) Write the solution of the Clairaut's equation  $y = px + ap/(bp + c)$ .
- d) Find the complete solution of  $\frac{\partial^2 z}{\partial x^2} - 7 \frac{\partial^2 z}{\partial x \partial y} + 6 \frac{\partial^2 z}{\partial y^2} = 0$ .
- e) Find particular integral of  $\frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = e^{2x+3y}$ .
- f) Establish the Newton Raphson method.
- g) Give the Gauss's backward interpolation formula.
- h) Write the formula for Simpson's  $\frac{3}{8}$  rule.
- i) Give the Milne's predictor corrector formula.
- j) Write the one dimensional wave equation.

**SECTION-B**

2. Solve:

a)  $\frac{dy}{dx} = \frac{5x^4 + 3x^2y^2 - 2xy^3}{5y^4 + 3x^2y^2 - 2x^3y}$

b)  $\frac{dy}{dx} - \frac{\tan y}{1+x} = (1+x)e^x \sec y$ .

3. a) Solve  $(x^2 D^2 + 4xD + 2)y = e^{e^x}$ .
- b) Solve using method of variation of parameters  $\frac{d^2 y}{dx^2} - 4y = e^{2x}$ .
4. Solve::
- a)  $x(y - z)p + y(z - x)q = z(x - y)$
- b)  $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin(x - 2y)$
5. a) Solve the PDE  $(D^2 - D')z = A \cos(lx + my)$ .
- b) Using method of separation of variables, solve  $\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y}$  with  $u(0, y) = 8e^{-3y}$ .

### SECTION-C

6. a) Find a root of  $x^3 - 2x - 5 = 0$  using bisection method correct upto three decimal places.
- b) Using interpolation, estimate number of students who got marks between 40 to 45 :

Marks	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
No. of students	31	42	51	35	31

7. a) Estimate  $f(22)$ , using Gauss forward difference formula:

$x$	20	25	30	35	40	45
$f(x)$	354	332	291	260	231	204

- b) Estimate  $\int_0^{0.6} e^{-x} dx$ , using Simpson's  $\frac{1}{3}$  rule by taking 7 ordinates.
8. a) Use Euler's modified method to find the value of  $y$  at  $x = 0.2$  upto 3 decimals, where  $y(0) = 2, \frac{dy}{dx} = \log(x + y)$ . (Take  $h = 0.1$ )
- b) Use Runge-Kutta method of order 4 to find the value of  $y$  at  $x = 0.1$  upto 3 decimals, where  $y(0) = 1, \frac{dy}{dx} = x + y^2$ .
9. Using Bendre-Schmidt method, solve the PDE  $2 \frac{\partial^2 f}{\partial x^2} = \frac{\partial f}{\partial t}; 0 < t < 1.5, 0 < x < 4$  subject to conditions  $f(x, 0) = 50(4 - x), f(0, t) = 0, f(4, t) = 0$ .

**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.**