

Roll No.

Total No. of Pages : 02

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B.Tech.(AI&ML /A&R /CSE /EE /EEE /ECE) (Sem.-2)

MATHEMATICS-II

Subject Code : BTAM202/18

M.Code : 91958

Date of Examination : 08-06-2024

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) Define exact ordinary differential equation.
- b) Find the general solution of the equation $y = xy' - (y')^3$.
- c) Give an example of Cauchy-Euler ordinary differential equation.
- d) Check whether the following partial differential equation is linear or non-linear

$$(x^2 - z^2) \frac{\partial z}{\partial x} + yz \frac{\partial z}{\partial y} = -3xy.$$

- e) Form the partial differential equation from $z = (x - a)^2 + (y - b)^2$ where a, b are arbitrary constants.
- f) Classify the following partial differential equation $\frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 0$.
- g) What is the order of convergence of Regula-Falsi method?
- h) Discuss the problem of interpolation.
- i) Give an example of a predictor-corrector method for solving initial value problems of ordinary differential equations,

- j) Differentiate between implicit and explicit finite difference methods for solving partial differential equations.

SECTION-B

- Determine for what values of a and b , the differential equation $(y + x^3) dx + (ax + by^3)dy = 0$ is exact.
- Solve the following equation by using the method of variation of parameters
$$y'' - 6y' + 9y = \frac{e^{3x}}{x^2}.$$
- Find the general solution of the following partial differential equation
$$\frac{\partial^2 z}{\partial x^2} + 6 \frac{\partial^2 z}{\partial x \partial y} + 9 \frac{\partial^2 z}{\partial y^2} = 6x + 2y.$$
- Solve $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$ by using method of separation of variables.

SECTION-C

- Use the Regula-Falsi method to find a real root of the equation $x^3 - 2x - 5 = 0$ correct to three decimal places.
- Using Newton's backward difference interpolation formula, find a polynomial of degree 4 in x which satisfies the following data

x:	1	2	3	4	5
y:	1	-1	1	-1	1

- Using fourth order Runge-Kutta method to find an approximate value of y when $x = 0.8$ given that $\frac{dy}{dx} = \sqrt{x + y}$, $y(0.4) = 0.4$. Take step-size $h = 0.2$.
- Solve $u_t = u_{xx}$ in $0 < x < 5$, $t \geq 0$ by using Crank-Nicolson method given that $u(x, 0) = 20$, $u(0, t) = 0$ and $u(5, t) = 100$. Compute u for the one time-step with $h = 1$.

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.