Roll No. | | | | | | | | | | | | | **Total No. of Pages: 02**

Total No. of Questions: 09

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 $3e^x \tan\ ydx + (1-e^x)\sec^2\ ydy = 0$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 $(x^2D^2 + 4xD + 2)y = e^{e^x}$.

   b) Solve using method of variation of parameters $\frac{d^2y}{dx^2} - 4y = e^{2x}$.

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.