Hall Ticket Number:

Code No. : 13463 N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. III-Semester Main & Backlog Examinations, Jan./Feb.-2024

Partial Differential Equations and Numerical Methods

(E.C.E.)

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10× 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Form the partial differential equation by eliminating 'a' and 'b' from $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$	2	2	1	1,2,12
2.	Solve the partial differential equation $p + q = pq$	2	2	1	1,2,12
3.	Solve the partial differential equation $py^3 + qx^2 = 0$ by the method of separation of variables	2	2	2	1,2,12
4.	Write (i) One-Dimensional Wave Equation (ii) One-Dimensional Heat Equation	2	1	2	1,2,12
5.	Evaluate $\Delta^n(e^x)$ interval of differencing being unity.	2	4	3	1,2,12
6.	Prove that $y_3 = y_2 + \Delta y_1 + \Delta^2 y_0 + \Delta^3 y_0$	2	3	3	1,2,12
7.	Write Newton's forward difference formulae of y' and y'' at $= x_0$.	2	1	4	1,2,12
8.	Using Euler's method find an approximate value of 'y' corresponding to x=1, given that $\frac{dy}{dx} = x + y$ and y=1 when x=0 (h=0.2)	2	2	4	1,2,12
9.	Write normal equations of fitting of a parabola by the method of Least Squares.	2	1	5	1,2,12
10.	If n=6, $\sum x$=34, $\sum x^2$=248, $\sum y$=90, $\sum y^2$=1446 and $\sum xy$=582 then find the coefficient of correlation.	2	1	5	1,2,12
	Part-B (5×8 = 40 Marks)				
11. a)	Form the partial differential equation from $F(x^2 + y^2 + z^2, z^2 - 2xy) = 0$	4	4	1	1,2,12
b)	Solve the partial differential equation $(x^2 - y^2 - z^2)p + 2xyq = 2xz$	4	3	1	1,2,12
12. a)	A tightly stretched string with fixed end points $x = 0$ and $x = \pi$ is initially at rest in its equilibrium position. If it is set vibrating by giving to each of its points an initial velocity $\left(\frac{\partial y}{\partial t}\right)_{t=0} = 0.03\, sinx - 0.04 sin3x$. Then find the displacement $y(x,t)$ at any point of the string at any time t.	4	4	2	1,2,12
b)	Using the method of separation of variables solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x,0) = 6e^{-3x}$	4	4	2	1,2,12
13. a)	Compute (a) y(9) and (b) y(17) from the following data:	4	4	3	1,2,12

x	8	10	12	14	16	18
y	10	19	32.5	54	89.5	15.4

R-20

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b)	Use Lagrange's interpolation formula to fit a polynomial to the following data. Hence find y(−2) and y(4). x: -1, 0, 2, 3 y: -8, 3, 1, 2	4	2	3	1,2,12
14. a)	Using Taylor series expansion evaluate the integral of $y' - 2y = 3e^x$, y(0) = 0 at x = 0.3	3	2	4	1,2,12
b)	Apply Runge-Kutta method of fourth order to find an approximate value of y when x=0.2, given that $\frac{dy}{dx} = x + y^2$ and y=1 when x=0 taking h=0.1.	5	2	4	1,2,12
15. a)	Predict y at x = 5 by fitting a least squares straight line to the following data: x: 2, 4, 6, 8, 10, 12 y: 1.8, 1.5, 1.4, 1.1, 1.1, 0.9	4	2	5	1,2,12
b)	Calculate the correlation coefficient r for the following data: x: 63, 50, 55, 65, 55, 70, 64, 70, 58, 68, 52, 60 y: 87, 74, 76, 90, 85, 87, 92, 98, 82, 91, 77, 78	4	1	5	1,2,12
16. a)	Solve the partial differential equation $p^2z^2 + q^2 = p^2q$	4	2	1	1,2,12
b)	Find the temperature in a bar of length 2 whose ends kept at zero and lateral surface insulated if the initial temperature is $sin\frac{\pi x}{2} + 3sin\frac{5\pi x}{2}$	4	4	2	1,2,12
17.	Answer any ***two*** of the following:				
a)	Find f (8) from the following data using interpolation approach. x: 4, 5, 7, 10, 11, 13 f (x): 48, 100, 294, 900, 1210, 2028	4	4	3	1,2,12
b)	Determine $y'(0), y''(0)$ from the following data: x: 0, 1, 2, 3, 4, 5 y: 4, 8, 15, 7, 6, 2	4	1	4	1,2,12
c)	Predict the radiation dose at an altitude of 3000 feet by fitting an exponential curve $y = ae^{bx}$ to the given data: Altitude x: 50, 450, 780, 1200, 4400, 4800, 5300 Dose of radiation y: 28, 30, 32, 36, 51, 58, 69	4	2	5	1,2,12

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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