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Reg. No.	:					38	108
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Question Paper Code: 50785

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017 Fourth Semester

Electrical and Electronics Engineering MA 6459: NUMERICAL METHODS

(Common to Aeronautical Engineering/Agriculture Engineering/Civil Engineering/ Electrical and Electronics Engineering/Electronics and Instrumentation Engineering/Geoinformatics Engineering/Instrumentation and Control Engineering/Manufacturing Engineering/Mechanical and Automation Engineering/ Petrochemical Engineering/Production Engineering/Chemical Engineering/ Chemical and Electrochemical Engineering/Handloom and Textile Technology/ Petrochemical Technology/Plastic Technology/Polymer Technology/Textile Chemistry/Textile Technology)

(Regulations 2013)

Time: Three Hours

Maximum: 100 Marks

Answer ALL questions.

PART - A

- 1. Write down the order of convergence of Newton-Raphson method.
- State the rate convergence of Gauss Jacobi method and Gauss Seidel method.
- 3. What is the nature of n^{th} divided differences of a polynomial of n^{th} degree ?
- 4. Distinguish between interpolation and extrapolation.
- 5. Write the formula for the derivative to compute at $\frac{dy}{dx}$ at the point $x = x_0$ by using

Newton's forward difference formula.

6. What is two-point Gaussian quadrature formula? For what class of functions f(x) does it given exact answers.

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- 7. State the modified Euler formula to find $y(x_1)$ for solving $\frac{dy}{dx} = f(x, y)$, $Y(x_0) = y_0$.
- 8. How many prior values are required in predictor-corrector formulae?
- 9. Write down the diagonal five point formula to solve the Laplace's Equation $\nabla^2 \ u(x,y) = 0 \, \cdot$
- 10. Write down the explicit formula to solve the hyperbolic equation $u_{tt} = 9u_{xx}$ when $\Delta x = 0.25$ and $\Delta t = 1/16$.

- 11. a) i) Find the smallest positive root of x³-2x-5=0 by the fixed point iteration method, correct to three decimal places.
 - ii) Find the inverse of the matrix $A = \begin{pmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{pmatrix}$ by Gauss-Jordan method. (8)

(OR)

- i) Solve the following system of equations by Gauss-Seidel method, correct to three decimal places:
 28x + 4y z = 32; x + 3y + 10z = 24 and 2x + 17y + 4z = 35.
 - ii) Find, by power method, the largest eigenvalue and the corresponding

eigenvector of a matrix
$$A = \begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$
 starting with initial vector $X^{(0)} = (1\ 0\ 0)^{T}$. (8)

- 12. a) i) Find the interpolation polynomial f (x) by Lagrange's formula and hence find f (3) for (0, 2), (1, 3) (2, 12) and (5, 147).
 - ii) Find the interpolation polynomial f (x) by using Newton's forward difference interpolation formula and hence find the value of f(5) for

b) Find the cubic spline approximation for the function given below.

$$x: 0 1 2 3$$

 $f(x): 1 2 33 244$
Assume that $M(0) = 0 = M(3)$. Hence find the value of $f(2.5)$. (16)

-3-13. a) i) Find the first and second derivatives of y with respect to x at x = 10 from the

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following data:

y: 31 43 57 41 ii) Evaluate $\iint_{00}^{22} f(x,y) dx dy by Trapezoi to three decimal places: $		x:		3	5		7 9	11	1		
to three decimal places: x		у:	3	1	43	5	7 41	27	7		-
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to three decimal places: x		ii) Ev	alua	te]]	1(x, y	y) dx d	ly by Trape:	zoidal r	rule for	r the following data, co	orrect
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y(0.1) = 1.01, $y(0.2) = 1.002$ and $y(0.2) = 1.002$		ii) Us	ing I	Adam	's m	ethod	find y(0.4)	, given	dy/dx	= (xy)/2, y(0) = 1,	
		у (0.1):	= 1.01	l, y (0.2) =	1.002 and y	(0.3) =	1.023	•	

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- 15. a) Solve $\nabla^2 u = -10(x^2 + y^2 + 10)$ in the square region $0 \le x, y \le 3$ with u = 0 on the boundary and mesh length 1 unit. (OR)
 - b) i) Solve the boundary value problem x y'' + y = 0 with the boundary conditions y(1) = 1 and y(2) = 2, taking h = 1/4 by finite difference method. (8)
 - ii) Solve $u_t = u_{xx}$ in 0 < x < 4, t > 0, given that u(0, t) = 0, u(4, t) = 0, u(x, 0) = x (8)

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