Code: 15A54301 **SS**

B.Tech II Year II Semester (R15) Regular Examinations May/June 2017

MATHEMATICS – III

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Show that the matrix $A = \begin{bmatrix} 1 & 1-3i & 3+5i \\ 1+3i & 8 & 6-7i \\ 3-5i & 6+7i & 4 \end{bmatrix}$ is Hermitian.

(b) Find the quadratic form relating to $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 4 & 5 \\ -1 & 5 & 2 \end{bmatrix}$.

(c) Give the formula for finding the square root of the number N, using Newton-Raphson formula.

(d) Explain briefly about Crout's triangular method.

(e) Write Newton's backward forward interpolation formulae.

(f) List the applications of Lagrange's formulae.

(g) Write the normal equations to fit the second degree polynomial.

(h) State Simpson's 3/8 the rule.

(i) Write Runge – Kutta third order formula.

(j) Write down the Liebmann's iterative formula for solving the Laplace equation.

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 Show that the matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$ satisfies its own characteristic equation and find A^{-1}.

OR

3 Reduce the real quadratic form
$3{x_1}^2 - 3{x_2}^2 - 5{x_3}^2 - 2x_1x_2 - 6x_2x_3 - 6x_3x_1$ to the canonical form.

UNIT - II

4 Find the positive root of $x^2 - \log_{10} x - 12 = 0$ by Regula Falsi method.

OR

5 Solve by using triangularisation method
$x + y = 2$; $2x + 3y = 5$.

UNIT - III

6 The following data gives the melting point of an alloy of lead and zinc, where t is the temperature in degree C and P is the percentage of lead in the alloy.

P	40	50	60	70	80	90
t	180	204	226	250	276	304

Find the melting point of alloy containing 84% lead.

OR

7 Using String's formula find $f(1.22)$.

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
$f(x)$	0.8484	0.8912	0.9320	0.9635	0.9854	0.9974	0.995	0.9938

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UNIT - IV

8 Fit a least square curve of the form $y = ae^{bx}$

x	1	2	3	4
y	1.65	2.70	4.50	7.35

OR

9 Find the value of $\int_0^1 \frac{dx}{1+x^2}$ taking 5 subintervals by Trapezoidal rule correct to five significant figures. Compare it with exact value.

UNIT - V

10 Using Runge – Kutta method, calculate $y(0.1)$ for $\frac{dy}{dx} = \frac{2xy}{1+x^2} + 1, \quad y(0) = 0.$

OR

11 Solve $y^{|} = y - x^2$ with $y(0) = 1$ by Picard's up to third approximation and find $y(0.1)$ and $y(0.2)$.

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