

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  $3x_1^2 - 3x_2^2 - 5x_3^2 - 2x_1x_2 - 6x_2x_3 - 6x_3x_1$  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

**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  $\frac{dy}{dx} = \frac{2xy}{1+x^2} + 1$ ,  $y(0) = 0$ .

**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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