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# B.Tech I Year (R13) Supplementary Examinations December 2019

#### MATHEMATICS – II

(Common to EEE, ECE, EIE, CSE & IT)

Max. Marks: 70

Time: 3 hours

#### **PART – A** (Compulsory Question)

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

(a) Find the Eigen values and the corresponding of  $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ .

(b) Show that  $A = \begin{bmatrix} 2 & 3+4i \\ 3-4i & 2 \end{bmatrix}$  is Hermitian.

(c) Define algebraic and transcendental equations with example each.

- (d) The value of  $\int_{1}^{2} \frac{1}{x} dx$  by Simpson's 1/3 rule (taking n = 4) is\_\_\_\_\_.
- (e) If  $\frac{dy}{dx} = -y$ , y(0) = 1, h = 0.01 then by Euler's method the value of  $y_1$  is \_\_\_\_\_.
- (f) Write the Fourier series of f(x) in [C, C+2L].
- (g) Find the Fourier cosine transform  $f(x) = e^{-ax}$ .
- (h) Define convolution theorem.
- (i) Write the two dimensional Laplace equation.
- (j) Form a partial differential equation by eliminating the arbitrary constants a and b from the equation: z = ax + by.

PART – B  
(Answer all five units, 5 X 10 = 50 Marks)  
UNIT – I  
$$\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \end{bmatrix}$$
 into its normal form and be

- 2 Reduce the matrix  $A = \begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$  into its normal form and hence find its rank.
- 3 Reduce the quadratic form  $3x^2 + 3y^2 + 3z^2 + 2xy + 2xz 2yz$  into canonical form using orthogonal transformation and find its rank, index and signature.

### UNIT – II

- 4 (a) Using Newton-Raphson method compute  $\sqrt{41}$  correct to four decimal places.
  - (b) Find the root of an equation  $2x \log x = 6$  by Regula-falsi method.

#### OR

- 5 (a) Evaluate  $\int_0^1 x^3 dx$  with five sub-intervals by Trapezoidal rule.
  - (b) Evaluate  $\int_{1}^{2} \frac{e^{x}}{x} dx$  using Simpson's  $\frac{1}{3}$  rule for n = 4.

## UNIT – III

- 6 Using Euler's method, solve for y at x = 0.1 from  $\frac{dy}{dx} = x + y + xy$ , y(0) = 1 taking step size h = 0.025.
- 7 Find the Half range cosine series of f(x) = x(1-x) in [0, 2].

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Find the Fourier series for 
$$f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \\ \frac{-\pi}{2}, & x = 0 \end{cases}$$

Hence deduce that  $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots = \frac{\pi^2}{8}$ .

- 9 (a) Find  $Z(n \sin n\theta)$ .
  - (b) Find  $Z^{-1}\left(\frac{z^3}{(z-3)(z-2)^2}\right), |z| > 3.$

UNIT – V

OR

10 Form the PDE by eliminating arbitrary function  $f(x^2 + y^2 + z^2, xyz) = 0$ .

OR

11 A bar of length *l* with insulated sides is initially 0°C temperature throughout the end x = 0 is kept at 0°C for all time and heat is suddenly applied such that  $\frac{\partial u}{\partial x} = 10$  at x = l for all time. Find the temperature function u(x, t).

