Code: 13A54102

AS

B.Tech II Year II Semester (R13) Supplementary Examinations May/June 2017

MATHEMATICS – II

(Computer Science and 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) Determine the rank of the matrix: $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$.

(b) Find the values of k for which the system of equations:
$(3k-8)x+3y+3z=0$
$3x+(3k-8)y+3z=0$
$3x+3y+(3k-8)z=0$ has a nontrivial solution.

(c) Given the values.

x:	5	7	11	13	17
f(x)	150	392	1492	2366	5202

Evaluate f(9), using Lagrange's interpolation formula.

(d) Use Simpson's 1/3rd rule to find $\int_0^{0.6} e^{-x^2}dx$ by taking seven ordinates.

(e) Apply Runge-Kutta fourth order method, to find an approximate value of y when x = 0.2, given that dy/dx = x+y and y = 1 when x = 0.

(f) Find the Fourier series to represent x^2 in the interval (-l, l)

(g) Find the Fourier cosine transform of e^{-x^2}.

(h) Find the z-transform of the following:
(i) 3n = 4 sin nπ/4 + 5a.
(ii) $(n + 1)^2$.

(i) Derive a partial differential equation (by eliminating the constants) from the equation $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$.

(j) Using the method of separation of variables solve $py^3 + qx^2 = 0$.

PART – B

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

UNIT - I

2 (a) Find the matrix p which transforms the matrix $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$ to the diagonal form. Hence calculate A^4.

(b) Reduce the quadratic form 2xy + 2yz + 2zx into canonical form.

OR

3 (a) Prove that the matrix $A = \begin{pmatrix} \frac{1}{2}(1+i) & \frac{1}{2}(-1+i) \\ \frac{1}{2}(1+i) & \frac{1}{2}(1-i) \end{pmatrix}$ is unitary and find A^{-1}.

(b) Prove that every Hermitian matrix can be written as A + iB, where A is real and symmetric and B is real and skew-symmetric.

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UNIT - II

4 (a) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position corrected to three decimal places.

(b) Find the positive root of $x^4 - x = 10$ corrected to three decimal places, using Newton-Raphson method.

OR

5 (a) From the following table, estimate the number of students who obtained marks between 40 and 45:

Marks:	30-40	40-50	50-60	60-70	70-80
No. of students:	31	42	51	35	31

(b) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using:

(i) Trapezoidal rule.
(ii) Simpson's 1/3 rule.
(iii) Simpson's 3/8 rule.

UNIT - III

6 (a) Solve by Taylor's series method the equation $\frac{dy}{dx} = \log(xy)$ for y(1.1) and y(1.2), given y(1) = 2.

(b) Apply Milne's method, to find a solution of the differential equation $y' = x - y^2$ in the range $0 \le x \le 1$ for the boundary conditions y = 0 of x = 0.

OR

7 (a) Find the Fourier series to represent $x - x^2$ from $x = -\pi$ to $x = \pi$.

(b) Express f(x) = x as a half range sine series in 0 < x < 2.

UNIT - IV

8 (a) Find the Fourier transform of:

$$f(x) = \begin{cases} 1 - x^2, & |x| \le 1 \\ 0, & |x| > 1 \end{cases}$$

Hence evaluate $\int_0^\infty \frac{x\cos x - \sin x}{x^3} \cos\frac{x}{2}\, dx$.

(b) Show that $Z(\sin hn\theta) = \frac{z \sin h\theta}{z^2 - 2z\cos h\theta + 1}$.

OR

9 (a) If $Z^{-1}[U(z)] = u_n \; and \; Z^{-1}[V(z)] = v_n$, then prove that $Z^{-1}[U(z).V(z) = \sum_{m=0}^{n} u_m . v_{n-m} = u_n * v_n$ where the symbol * denotes the convolution operation.

(b) Find the inverse z.-transform of $\frac{z^3 - 20z}{(z-2)^3(z-4)}$.

UNIT - V

10 Solve the differential equation $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ for the conduction of neat along a rod without radiation, subject to the following conditions:

(a) U is not infinite for $t \to \infty$.

(b) $\frac{\partial u}{\partial x} = 0 \; for \; x = 0 \; and \; x = l$.

(c) $u = lx - x^2$ for t = 0, between x = 0 and x = l.

OR

11 Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions $u(0,y) = u(l,y) = u(x,0) = 0$ and $u(x,a) = \sin n\pi x/l$.

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