

(DCE 211)

B. Tech. DEGREE EXAMINATION, MAY - 2015

(Examination at the end of Second Year)

CIVIL ENGINEERING

Paper - I : Mathematics - III

Time : 3 Hours

Maximum Marks : 75

Answer question No.1 compulsory

(15)

Answer ONE question from each unit

(4 × 15 = 60)

1) Answer the following questions :

- a) State Euler's formula.
- b) Define periodic function.
- c) Define even function.
- d) Find a_0 in the Fourier series of $f(x) = |\sin x|$ in the interval $-\pi < x < \pi$.
- e) Write a formula for Fourier cosine transformation of $\frac{\partial^2 v}{\partial x^2}$ x, t , $-\pi < x < \pi$.
- f) State the parseval's formula.
- g) Define Fourier sine integral.
- h) If $f(x)=x^2$ is expressed as a Fourier series in $(-1, 1)$, then find the Fourier coefficient 'b_n'.
- i) Evaluate $\Delta^3(e^x)$.
- j) State Newton's Backward interpolation formula.
- k) Define complex form of Fourier series.
- l) Define interpolation.

- m) State the Stirling's interpolation formula.
- n) Write Bessel's formula.
- o) State Simpson's $\frac{3}{8}$ rule

UNIT - I

- 2) a) Find the Fourier series of the following function :
 $f(x) = x^2 \quad 0 \leq x \leq \pi = -x^2 - \pi \leq x \leq 0$
- b) Find the half-range cosine series of the function $f(x) = (x - 1)^2$ in the interval $0 < x < 1$,
 Hence show that $\pi^2 = 8 \left[\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots \right]$.

OR

- 3) a) If $f(x) = |\cos x|$, expand $f(x)$ as a Fourier series in the interval $(-\pi, \pi)$.
- b) Obtain the half range sine series for e^x in the interval $0 < x < 1$.

UNIT - II

- 4) a) Obtain the first three coefficients in the Fourier cosine series for y , where y is given in the following table.
- | | | | | | | |
|-------|---|---|----|---|---|---|
| $x :$ | 0 | 1 | 2 | 3 | 4 | 5 |
| $y :$ | 4 | 8 | 15 | 7 | 6 | 2 |
- b) Find the Fourier cosine transform of e^{-x^2} and hence evaluate Fourier sine transform of xe^{-x^2} .

OR

- 5) a) Find the Fourier sine transform of $\frac{1}{x^2 + a^2}$.
- b) Solve the integral equation $\int_0^\alpha f(x) \cos \lambda x \, dx = e^{-\lambda}$.

UNIT - III

- 6) a) Find a real root of the equation $3x = \cos x + 1$ by using Newton-Raphson method.
- b) Find the missing terms of the following data :

x	1	1.5	2	2.5	3	3.5	4
$f(x)$	6	?	10	20	?	1.5	5

OR

- 7) a) Using Newton's forward formula, find the value of $f(1.6)$, if

x	1	1.4	1.8	2.2
$f(x)$	3.49	4.82	5.96	6.5

- b) If $Y_{10} = 3$, $Y_{11} = 6$, $Y_{12} = 11$, $Y_{13} = 18$, $Y_{14} = 27$, find Y_4

UNIT - IV

- 8) a) For the given values.

x	150	152	154	158
$y = \sqrt{x}$	12.247	12.329	12.410	12.554

Evaluate $\sqrt{155}$ using Lagranges interpolation formula.

- b) Using Newton's divided differences formula, evaluate $f(8)$ and $f(15)$. Given.

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

OR

- 9) a) Find the first and second derivatives of $f(x)$ at $x = 1.5$ if

x	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$	3.375	7.000	13.625	24.000	38.875	59.000

- b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using trapezoidal rule taking $h = \frac{1}{4}$.

