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CBCS SCHEME

15MAT31

Third Semester S.E. Degree Examination, June/July 2019
Engineering Mathematics - III

Time: 3 hrs. Max. Marks: 80

Note: *Answer* ***any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Obtain the Fourier series for the function :

$$f(x) = \begin{cases} -\pi & \text{in } -\pi < x < 0 \\ x & \text{in } 0 < x < \pi \end{cases}$$

Hence deduce that $\left(\frac{1}{2n-1}\right)^2 = \frac{\pi^2}{8}$. **(08 Marks)**

b. Express y as a Fourier series up to the second harmonics, given :

x	0	IX	2%	Tr	4%	5%	2n
y	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

(08 Marks)

OR

2 a. Obtain the Fourier series for the function f(x) = $2x - x^2$ in $0 < x < 2$. **(08 Marks)**

b. Obtain the constant term and the first two coefficients in the only Fourier cosine series for given data :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

(08 Marks)

Module-2

3 a. Find the Fourier transform of e^{-ax}. **(06 Marks)**

b. Find the Fourier sine transform of $\frac{e^{-ax}}{x}$, $a > 0$. **(05 Marks)**

c. Obtain the z - transform of sin nO and cos nO **(05 Marks)**

OR

4 a. Find the inverse cosine transform of $F(a) = \begin{cases} 1 - a, & 0 < a < 1 \\ 0, & a > 1 \end{cases}$

Hence evaluate $\int_0^\infty \frac{\sin^2 t}{t}\,dt$. **(06 Marks)**

b. Find inverse Z - transform of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$ **(05 Marks)**

c. Solve the difference equation $y_{n+2} - 6y_{n+1} + 9y_n = 2^n$ with $y_0 = 0$, $y_1 = 0$, using z - transforms. **(05 Marks)**

Module-3

5 a. Find the lines of regression and the coefficient of correlation for the data :

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	**14**

(06 Marks)

b. Fit a second degree polynomial to the data :

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

(05 Marks)

c- Find the real root of the equation x sin x + cos x = 0 near x = rc, by using Newton — Raphson method upto four decimal places. **(05 Marks)**

OR

6 a. in a partially destroyed laboratory record, only the lines of regression of y on x and x on y are available as 4x — 5y + 33 = 0 and 20x — 9y = 107 respectively. Calculate x, y and the coefficient of correlation between x and y. **(06 Marks)**

b. **Fit a** curve of the type $y = ae^{bx}$ to the data :

x	5	15	20	30	35	40
y	10	14	25	40	50	62

(05 Marks)

C. Solve cos x = 3x — 1 by using Regula — Falsi method correct upto three decimal places, (Carryout two approximations). **(05 Marks)**

Module_4

7 a. Give f(40) = 184, f(50) = 204, 1(60) = 226, I(70) = 250, f(80) = 276, f(90) = 304. Find f(38) using Newton's forward interpolation formula. **(06 Marks)**

b. Find the interpolating polynomial for the data :

x	0	1	2	5
y	2	3	12	147

By using Lagrange's interpolating formula. **(05 Marks)**

c. Use Simpson's 8th rule to evaluate $\int_0^{0.3} (1-8)(^3)\ ^2\, dx$ considering 3 equal intervals.

(05 Marks)—

OR

8 a. The area of a circle (A) corresponding to diameter (D) is given below :

D	80	85	90	95	100
A	5026	5674	6362	7088	7854

Find the area corresponding to diameter 105, using an appropriate interpolation formula. **(06 Marks)**

b. Given the values :

x	5	7	11	13	17
g ,	150	392	1452	2366	5202

Evaluate f(9) using Newton's divided difference formula. **(05 Marks)**

c. Evaluate $\int_0^1 \frac{\quad}{1+x^6}\, dx$ by Weddle's rule taking seven ordinates. **(05 Marks)**

Module-5

a. Using Green's theorem, evaluate $\int_C (2x^2 - y^2)dx + (x^2 + y^2)dy$ where C is the triangle formed by the lines x = 0, y = 0 and x + y = 1. **(06 Marks)**

b. Verify Stoke's theorem for $\vec{f} = (2x - y)\vec{i} - yz^2\vec{j} - yz\vec{k}$ for the upper half of the sphere $x^2 + y^2 + z^2 = 1$. **(05 Marks)**

c. Find the extremal of the functional $\int_{x_1}^{x_2} \{y^2 + (y^1)^2 + 2ye^x\}dx$ **(05 Marks)**

OR

10 a. Using Gauss divergence theorem, evaluate $\int\int_S \vec{f} \cdot \vec{n} ds$, where $\vec{f} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$ and s is the surface of the cube bounded by x = 0, x = 1, y = 0, y = 1, z = 0, z = 1. **(05 Marks)**

b. A heavy cable hangs freely under the gravity between two fixed points. Show that the shape of the cable is a Catenary. **(06 Marks)**

c. Find the extremal of the functional $\int_0^{7t} (y^2 + 4y\cos x)dx$, give that y = 0 = y(7t/2). **(05 Marks)**