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17MAT31

Third Semester B.E. Degree Examination, Dee.2018/Jan.2019

Engineering Mathematics - III

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Find the Fourier series expansion for the periodic function f(x), if in one second

f (x) = 0; -n<x<O
x; 0 < x < (08 Marks)

b. Expand the function f(x) = x(7-x) over the interval (0, 7) in half range Fourier cosine series. (06 Marks)

c. The following value of function y gives the displacement in inches of a certain machine part for rotations x of a flywheel. Expand y-in terms of Fourier series upto the second harmonic.

Rotations	x	0	7/6	27/6	37/6	47/6	57c/6	TC
Displacement	y	0	9.2	14.4	17.8	17.3	11.7	0

(06 Marks)

OR

2 a. Find the Fourier series expansion for the function :

f(x) = TrX ; 0 < X < 1
(2-x);

and deduce $\frac{Tr^2}{8} = \sum_{n=1}^{x} \frac{1}{(2n-1)^2}$ (08 Marks)

b. Expand in Fourier series f(x) = - x)^2 over the interval 0 x 27. (06 Marks)

c. The following table gives the variations of periodic current over a period T.

t (secs)	0	T/6	T/3	T/2	2T/3	5T/6	T
A (Amps)	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Expand the function (periodic current) by Fourier series and show that there is a direct current part of 0.75 amp and also obtain amplitude of first harmonic. (06 Marks)

Module-2

3 a. Find Fourier transform of f(x) 1- x ; x1<1
o ; ixi> 1

and hence evaluate $\int_0^{ac} \frac{x \cos x - \sin x}{} dx$. (08 Marks)

b. Find Fourier Cosine transform of the function :

4x ; 0 < x <1
f(x) = 4 - x ; 1 < x < 4
O; x > 4 (06 Marks)

c. Find z-transforms of : i) a^n sin nO ii) a^{-n} cos nO. (06 Marks)

OR

4 a. Find Fourier sine transform of f(x) = and hence evaluate : $\int_0 \frac{x \sin mx}{1+x`} dx$, m > 0 .

(08 Marks)

b. Find z-transform of u_n = cos h $\frac{nit}{2}$ +u (06 Marks)

c. Solve the difference equation using z-transforms $u_{n+2} + 6u_{n+1} + 9u_n = 2^n$ .Given u0 =u_1 = 0.

(06 Marks)

Module-3

5 a. If 0 - is the acute angle between the two regression lines relating the variables x and y, show that Tan() = $\left| \frac{1-r^2}{r} \quad \frac{CT_x CY y}{G_x G_y^2} \right|$ (08 Marks)

Indicate the significance of the cases r = ±1 and r = 0.

b. Fit a straight line y = ax +b for the data.

x	12	15	21	25
y	50	70	100	120

(06 Marks)

c. Find a real root of the equation by using Newton-Raphson method near x = 0.5, $xe^x = 2$, perform three iterations. (06 Marks)

OR

6 a. Compute the coefficient of correlation and equation of regression of lines for the data :

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

(08 Marks)

b. The Growth; f an organism after x - hours is given in the following table :

x (hours)	5	15	20	30	35	40
y (Growth)	10	14	25	40	50	62

Find the best values of a and b in the formula, y = ae $^{b(}$ to fit this data. (06 Marks)

Find a real root of the equation cos x =3x - 1 correct to three decimals by using Regula - False position method, given that root lies in between 0.6 and 0.7. Perform three iterations. (06 Marks)

Module-4

7 a. Find y(8) from y(1) = 24, y(3) = 120, y(5) = 336, y(7) = 720 by using Newton's backward difference interpolation formula. (08 Marks)

b. Define f(x) - as a polynomial in x for the following data using Newton's divided difference formula. (06 Marks)

x	-4	-1	0	2	5
f(x)	1245	33	5	9	1335

c. Evaluate the integral I = $\int_0^1 \frac{dx}{4x+5}$ using Simpson's 3rd rule using 7 ordinates. (06 Marks)

OR

8 a. For the following data calculate the differences and obtain backward difference interpolation polynomial. Hence find f(0.35). (08 Marks)

x	0.1	0.2	0.3	0.4	0.5
f(x)	1.40	1.56	1.76	2.0	2.28

b. Using Lagrange's interpolation find y when x = 10.

x	5	6	9	11
y	12	13	14	16

(06 Marks)

c. Evaluate $\int_0 \frac{x}{1+x^2} \frac{2}{2}\cdot dx$ by Weddle's rule considering seven ordinates. (06 Marks)

Module-5

9 a. Verify the Green's theorem in the plane for J $(x^2 + y^2)dx + 3x^2y\,dy$ where C - is the circle $x^2+y^2 = 4$ traced in positive sense. (08 Marks)

b. Evaluate (sin z.dx - cos xdy + sin ydx) by using Stokes theorem, where C - is the boundary of the rectangle 0 < x < 7E, 0 < y < I and z = 3. (06 Marks)

c. Find the curve on which the functional : $S[/^{12} + 12xy]dx$ with y(0) = 0, y(1) = I can be extremised. (06 Marks)

OR

10 a. Given f = $(3x^2 - y)i + xzj + (yZ - x)k$ evaluate $\int f \cdot dr$ from (0, 0, 0) to (1, 1, 1) along the paths x = t, $y = t^2$ and z e. (08 Marks)

b. Derive Euler's equation in the form $\frac{af}{Ey} \; \frac{d}{dx} \left| \frac{af}{} \right| = 0$ (06 Marks)

c. Prove that the shortest distance between two points in a plane is a straight line. (06 Marks)