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Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Mathematics - III

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO full questions from each part.*

PART _ A

1 a. Find the Fourier series of f(x) $\begin{cases} 7+2x & \text{in } -7c<x<0 \\ -2x & \text{in } 0<X<TC \end{cases}$ (06 Marks)

b. Obtain Fourier half range sine series of f(x) = $\begin{cases} \frac{1}{4}-x & ; 0<x<\frac{1}{2} \\ x-\frac{3}{4} & \frac{1}{2}<x<1 \end{cases}$ (07 Marks)

c. Find the Fourier series of y u to second harmonics from the following table:

x:	0	2	4	6	8	10	12
y:	9	182	24.4	27.8	27.5	22	

(07 Marks)

2 a. Find the Fourier transform of f(x) = $\begin{cases} 1-x^2 & \text{for } |x| < 1 \\ 0 & \text{for otherwise} \end{cases}$ and hence deduce that

$$\int \frac{x\cos x - \sin x}{x^3}\cdot dx = \frac{-\pi}{4}$$ (07 Marks)

b. Find the inverse Fourier sine transform of $F_s(u) = \frac{1}{u}e^{-au}$, a > 0 . (06 Marks)

c. Find the Fourier cosine transform of f(x) = $\frac{1}{1+x^2}$ (07 Marks)

3 a. Obtain the various possible solutions of the Laplace's equation $u_t + u_y = 0$ by the method of separation of variables. (07 Marks)

Solve the heat equation $u_t = c^2 u_{xx}$ subject to the conditions, u(0, t) = 0, u(10, t) = 0 and u(x, 0) = f(x) where f(x) $\begin{cases} x & \text{in } 0 < x < 5 \\ 10-x & \text{in } 5<x<10 \end{cases}$ (06 Marks)

c. Obtain the D'Alembert's solution of the one dimensional wave equation. (07 Marks)

4 a. Fit a parabola of the form y = a

x:	0	1	2	3	4	5
y:	1	3	7	13	21	31

(06 Marks)

b. Minimize: z = 5x + 4y subject to the constraints x + 2y 10, x + y > 8, 2x + y > 12, x 0, y 0 by graphical method. (07 Marks)

c. Maximize z = 6x + 9y subject to the constraints 2x + 2y < 12, x + 5y < 44, 3x + y <_ 30, x 0, y 0 by applying simplex method. (07 Marks)

PART – B

5 a. Using Regula-falsi method find the real root of tanx + tanhx = 0, which lies between 2 and 3 carryout three iterations. (06 Marks)

b. Apply Gauss-Seidel method to solve equations 12x + y + z = 31, 2x + 8y – z = 24, 3x + 4y + 10z = 58. Perform four iterations. (07 Marks)

c. Using Rayleigh power method find the largest eigen value and the cOrtesponding eigen vector of the matrix A = $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ use [1 0 01[1.] as initial vector, carry out six iterations. (07 Marks)

6 a. From the following data, estimate the number of students who have scored less than 70 marks:

Marks:	0-20	20-40	40-60	60-80	80-100
No. of students:	41	62	65	50	17

(06 Marks)

b. Use Lagrange's interpolation formula to fit a polynomial for the data:

x:	0	1	3	4
y	-12	0	6	12

Hence estimate y at x = 2. (07 Marks)

c. Evaluate, $\int_0^{03} (1 - 8x^3)\,dx$ by using Simpsons 318th rule, taking six equal pare. (07 Marks)

7 a. Solve $\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$, subject to u(0, t) = 0, u(4, t) = 0, u(x, 0) = x(4 – x) by taking h = 1, k = 0.5 upto four steps. (07 Marks)

b. Solve $\frac{\partial u}{\partial x^2} = 32\frac{\partial u}{\partial t}$ subject to u(0, t) = 0, u(1 , t) = t and u(x, 0) = 0 upto t = 5 by Bendre-Schmidt process taking h = $\frac{1}{4}$. (07 Marks)

c. Solve $u_{xx} + u_{yy} = 0$ in the following square region with the boundary conditions as indicated in the figure: (06 Marks)

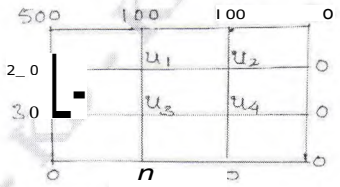

Fig.Q.7(c)

8 a. Find the Z-transforms of sinhnO and coshnO. (06 Marks)

b. If $u(z) = \frac{2z^2 + 5z + 14}{(z-1)^4}$. Find the values of uo, ui, uzand u3. (07 Marks)

c. Solve the difference equation $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$ with uo = 0 and ui = 1 by using z-transform. (07 Marks)

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