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06MAT31

Third Semester B.E. Degree Examination, December 2011
Engineering Mathematics

Time: 3 hrs. Max. Marks:100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Find a Fourier series to represent $f(x)=\begin{cases}0 & -\pi\le x\le 0\\ x^2 & 0\le x\le \pi\end{cases}$. **(06 Marks)**

b. Find half range cosine series of $f(x)=1-\frac{x}{l}$ in (o, l). **(07 Marks)**

c. Compute the Fourier coefficients a_0, a_1, a_2, b_1 and b_2 for f(x) tabulated below: **(07 Marks)**

x	0	1	2	3	4	5
f(x)	9	18	24	28	26	30

2 a. Find Fourier transform of,

$$f(x)=\frac{1}{2a} \quad |x|\le a$$
$$= 0 \quad |x|>a$$

(06 Marks)

b. Find Fourier cosine transform of e^{-ax}, $a\ge 0$, hence find $\int_0^\infty \frac{\cos\alpha x}{a^2+\alpha^2}dx$. **(07 Marks)**

c. Find the inverse Fourier sine transform of $\frac{1}{s}e^{-as}$. **(07 Marks)**

3 a. Form the second order partial differential equation of $z = xf(ax+by)+g(ax+by)$. **(06 Marks)**

b. Solve : $(y+zx)z_x-(x+yz)z_y = x^2-y^2$. **(07 Marks)**

c. Solve : $3u_x+2u_y=0$, given $u(x,0)=4e^{-x}$ using method of separation of variables. **(07 Marks)**

4 a. With suitable assumptions, derive one dimensional equation for heat flow. **(06 Marks)**

b. Solve : $\frac{\partial^2 u}{\partial t^2}=c^2u_{xx}$ by the method of separation of variables. **(07 Marks)**

c. Solve $u_{xx}+u_{yy}=0$, for $0<x<a$, $0<y<b$ and $u(x, 0) = 0$; $u(x, b) = 0$; $u(0, y) = 0$; $u(a, y) = f(y)$. **(07 Marks)**

PART – B

5 a. Find the third approximate root of $xe^x-2=0$, by Regula Falsi method. **(06 Marks)**

b. Using Gauss Seidel method of iteration, find a, b, c (4^{th} iteration values), given $5a-b=9$, $a-5b+c=-4$, $b-5c=6$ taking $\left(\frac{9}{5},\frac{4}{5},\frac{6}{5}\right)$ as first approximation. **(07 Marks)**

c. Find all the eigen values and the eigen vector corresponding to smallest eigen value of:

$$\begin{bmatrix}1 & 0 & -1\\ 1 & 2 & 1\\ 2 & 2 & 3\end{bmatrix}$$

(07 Marks)

6 a. Given the following table of x and f(x), fit a Lagrangian polynomial and hence find f(1) and f(4). **(06 Marks)**

x	-1	0	2	3
f(x)	-8	3	1	2

b. Using Newton's dividend different formula, find f(2, 5) given:

x	-3	-1	0	3	5
f(x)	-30	-22	-12	330	3458

(07 Marks)

c. Tabulate the values y =$\log_e$ x, $4 \le x \le 5.2$, in steps of 0.2 and find $\int_4^{5.2} \log_e x \, dx$ using Simpons' $\frac{3}{8}$ rule. **(07 Marks)**

7 a. Derive eulers' equation for extremal value in the form $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$. **(06 Marks)**

b. Determine the plane curve down which a particle will slide down without friction from $A(x_1, y_1)$ to $B(x_2, y_2)$ in shortest time. **(07 Marks)**

c. The curve 'C' joining the two points $A(x_1, y_1)$ to $B(x_2, y_2)$ is rotated about x-axis, find equation of 'C' such that the solid of resolution has minimum surface area. **(07 Marks)**

8 a. Find $z(e^{-an} \sin n\theta)$ and $z(n \cos n\theta)$. **(06 Marks)**

b. Find z^{-1} of $\left\{\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}\right\}$. **(07 Marks)**

c. Solve : $u_{n+2} + 2u_{n+1} + u_n = n$ given $u_0 = u_1 = 0$. **(07 Marks)**

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