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Total no of pages :2
Total No.of Questions:09

B. Tech (Sem.3rd)

ENGINEERING MATHEMATICS-III
Subject Code :BTAM-301
Paper ID : [A1128]

Time: 3 Hrs. **Max. Marks :60**

Note:- (1) Section-A is compulsory all question attempts, Consisting of Ten short answer type question carrying Two marks each.
(2) Attempt any Four question is Section-B. each question carrying Five marks.
(3) Attempt any Two question is Section-C.each question carrying Ten marks.

SECTION-A

Q1. (a) Explain Euler's formula for finding Fourier series for the function f (x) over the interval $-\pi \leq x \leq \pi$, (2x10=20)

(b) Discuss whether cosecx can be expanded in the fourier series in 'the interval $-\pi \leq x \leq \pi$?

(c) State and prove First shifting theorem of finding Laplace transform.

(d) Find Laplace transform of $e^{-2t}\int_0^t \frac{\sin t}{t}dt$

(e) Write down the expression for generating function of Bassel's function. In(x), nu + w integer.

(f) Find the solution of $x\frac{d^2y}{dx^2}+y=0$ in terms of Bessel's function.

(g) Form the Partial Differential by eliminating arbitrary function from $z=f_1(x)f_2(y)$

(h) Solve the Partial Differential equation $P\tan x-\tan yq=\tan z$, Where $p=\frac{\partial z}{\partial x}, q=\frac{\partial z}{\partial y}$

(i) Show that $f(z)=\cosh z$ is analytic.

(j) Find the bilinear transformation that map the points $z=0,-i,-l$ into the points $w=i,l,0$

SECTION-B (4x5=20)

Q2. Find the Half range Fourier cosine series of the function

$f(x)=(x-1)^2, 0 \le x \le 1$ Also deduce that

$$\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \text{-----}$$

Q3. Using method of Laplace Transfom,Solve the following Differential equation

$$\frac{d^2x}{dt^2} + 9x = \cos 2t, \quad x(0)=1, x(\pi/2)=-1$$

Q4. Solve the homogeneous partial differential equation

$$\frac{\partial^2 z}{\partial x^2} - 3\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = e^{2x+3y} + \sin(x-2y)$$

Q5. Prove that $\frac{d}{dx}[x^n J_n(x)] = x^n J_{n-1}(x)$

Q6. Find the analytic function whose imaginary part is $\sinh x \cos y$.

SECTION-C (10x2=20)

Q7. Find series solution of the differential equation $x(2+x^2)\frac{d^2y}{dx^2} - \frac{dy}{dx} - 6xy = 0$

Q8. A homogeneous rod of conducting material of length 1 cm has its ends kept at zero temperature and the temperature initially is

$u(x,0) = 3\sin \pi x$, Find the temperature $u(x,t)$ at any time.

Q9. (a) Expand $\frac{1}{(z+1)(z+3)}$ in Laurrent series in the interval $1 < |z| < 3$

(b) Evaluate $\int_C \frac{z+1}{z^4-2z^3} dz$ where C is the circle $|z| = 1/2$

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