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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 $(2 \times 10 = 20)$ interval $-\pi \leq x \leq \pi$,
- (b) Discuss whether $\operatorname{cosec} x$ 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. $J_n(x)$, n + w integer.
- (f) Find the solution of $x \frac{d^2 y}{dx^2} + y = 0$ in terms of Bessel's function.
- (g) Form the Partial Differential by eliminating arbitrary function from $f_1(x)f_2(y)$
- (h) Solve the Partial Differential equation $P \tan x - \tan y q = \tan z$. 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 $z=0, -i, -1$ into the points $w=i, 1, 0$

SECTION-B

(4x5=20)

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

$$f(x) = (x-1)^2, 0 \leq x \leq 1 \text{ Also deduce that}$$

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

- Q3. Using method of Laplace Transform, 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 $x(2+x^2) \frac{d^2y}{dx^2} - \frac{dy}{dx} - 6x = 0$

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

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

- Q9. (a) Expand $\frac{1}{(z+1)(z+3)}$ in Laurent 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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