Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (EE) PT (Sem.–1)

ENGINEERING MATH-III

Subject Code : BTAM-301

Paper ID : [A2223]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt ANY FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Solve the following :

(a) Find the half range sine series for 1 in the interval $(0, \pi)$.

(b) Find Laplace transform of the function $e^{-t}t^k$.

(c) Write Bessel equation of order zero.

(d) Form a differential equation from $z = f(x^2 + y^2)$.

(e) Write down the three possible solutions when we solve the Laplace equation in two dimensions by applying the method of separations of variables.

(f) Find Taylor's series expansion of $\frac{1}{z+1}$, about $z = 1$.

(g) Write the polynomial $2x^2 + x + 3$ in terms of Legendre's polynomial.

(h) State Cauchy's theorem.

(i) Find the inverse Laplace transform of the function $\frac{s+2}{s^2-4s+13}$.

(j) Find the harmonic conjugate of $x^3 - 3xy^2$.

SECTION-B

2. Find the fourier series to represent $f(x) = x - x^2, -\pi \le x \le \pi$. Show that

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + ... = \frac{\pi^2}{12}$$

3. Show that $\frac{d}{dx}\{x^{-n}J_n(x)\} = -x^{-n}J_{n+1}(x)$, where the letters have their usual meanings.
4. Find the transformation which maps the points 1, i, -1 of the z-plane onto 0,1 ∞ of the w-plane respectively.
5. Solve $y'' - 3y' + 2y = 4t + e^{3t}$, where $y(0) = 1$ and $y'(0) = -1$, using Laplace Transforms.

SECTION-C

6. Solve the partial differential equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y} = \cos(2x + y)$.
7. Solve in series the differential equation $8x^2 \frac{d^2 y}{dx^2} + 10x\frac{dy}{dx} - (1 + x)y = 0$.
8. A rod 30 cm. long, has its ends A and B kept at 20°C and 80°C respectively until steady state conditions prevail. The temperature at each end is then suddenly reduced to 0°C and kept so. Find the resulting temperature function $u(x, t)$ taking $x = 0$ at A.
9. Determine poles and residue at its each pole of the function

$$f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)}$$

and hence evaluate $\int_C f(z)dz$, where C is the circle $|z| = \frac{5}{2}$.