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

Total No. of Questions : 09

B.Tech.(CE)/(ECE)/(EE)/(Electrical & Electronics)/ (Electronics & Computer Engg.)/(Electronics & Electrical)/(ETE) (2011 Onwards)
B.Tech.(Electrical Engg. & Industrial Control) (2012 Onwards)
B.Tech.(Electronics Engg.) (2012 Onwards)
(Sem.–3)

ENGINEERING MATHEMATICS – III

Subject Code : BTAM-301
Paper ID : [A1128]

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 contains FIVE questions carrying FIVE marks each and students have to attempt ANY FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt ANY TWO questions.**

SECTION-A

1. Solve the following :

(a) What is Euler's formulae for the fourier series expansion of the function $f(x)$ in the interval $\alpha < x < \alpha + 2\pi$.

(b) Find Laplace transform of the function $\frac{\sin t}{t}$.

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

(d) Find the value of $\int_{-1}^{1} (2x+1)\, P_3(x)\, dx$, where $P_3(x)$ is the third degree Legendre's polynomial.

(e) Solve $2\frac{\partial^2 z}{\partial x^2} - 5\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = 0$.

(f) If $f(x)$ is an odd function in $(-c, c)$, then what are the values of a_0 and a_n?

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

(h) Is the function $f(x, y) = 4xy - 3x + 2$ harmonic? Justify your answer.

(i) Evaluate $L^{-1}\left(\frac{s+2}{s^2(s+1)(s-2)}\right)$.

(j) Evaluate $\int_0^{1+i}(x^2 - iy)\,dz$ along the path $y = x^2$.

SECTION-B

2. Obtain the half range cosine series for $f(x) = (x-1)^2$ in the interval $0 < x < 1$. Hence show that $\pi^2 = 8\left(\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+...\right)$.

3. Solve $y'' + y' - 2y = 1 - 2x$, where $y(0) = 0$ and $y'(0) = 4$, using Laplace Transforms.

4. Find the transformation which maps the points 1, i, -1 of the z-plane onto i, $0 - i$ of the w-plane respectively.

5. Solve the partial differential equation $(y + z)\,p - (z + x)\,q = x - y$.

6. Show that $J_n(x) = \frac{x}{2n}(J_{n-1}(x) + J_{n+1}(x))$? Where the letters have their usual meanings?

SECTION-C

7. Solve the wave equation $= \frac{\partial^2 u}{\partial t^2} = a^2\frac{\partial^2 u}{\partial x^2}$, under the condition : $u = 0$ when $x = 0$ and $x = \pi$, $\frac{\partial u}{\partial t} = 0$ when $t = 0$ and $u(x, 0) = x$, $0 < x < \pi$.

8. State and prove Cauchy's integral formula. Use it to evaluate $\int_C \frac{z^2 - z + 1}{z - 1}dz$ where C is the circle (i) $|z| = 1$ (ii) $|z| = \frac{1}{2}$.

9. Solve in series the differential equation $2x(1-x)\frac{d^2y}{dx^2} + (5 - 7x)\frac{dy}{dx} - 3y = 0$.