

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

- Obtain the half range cosine series for $f(x) = (x-1)^2$ in the interval $0 < x < 1$. Hence show that $\pi^2 = 8\left(\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots\right)$.
- Solve $y'' + y' - 2y = 1 - 2x$, where $y(0) = 0$ and $y'(0) = 4$, using Laplace Transforms.
- Find the transformation which maps the points $1, i, -1$ of the z -plane onto $i, 0, -i$ of the w -plane respectively.
- Solve the partial differential equation $(y+z)p - (z+x)q = x-y$.
- 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

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