Total No. of Questions: 09

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

ENGINEERING MATHEMATICS – III

M Code: 56071

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. a) Evaluate, $\int \frac{z^3}{z+i}\,dz$ along the circle, $|z| = 2$.

   b) Under what condition or conditions the general linear partial differential equation of second order is elliptic.

   c) Define the term "an indicial equation".

   d) Find , L [(t e^{-t} sin4t)].

   e) Form a partial differential equation from z = f(x +y-z, xyz).

   f) Expand sin z in Taylor's series about the point z = 0.

   g) Find the sum of the residues at each pole of the function f(z), lying inside the circle $|z| = 3$ where f(z) = $\frac{\tan z}{z}$.

   h) If it is required to find the Fourier series of an odd function in (-π, π) then which formulae you will use?

   i) What are Dirichlet's conditions for the expansion of f(x) as a Fourier series in (-π, π)?

   j) State the change of scale property of Laplace transforms.

SECTION B

2. Solve the partial differential equation, $(D^3 - 4D^2D' + 4DD')z = 6 \sin (3x + 2y)$.

3. State and prove the Cauchy's integral formula.

4. Using Laplace transforms, solve the differential equation,

$$\frac{d^2x}{dt^2} + 9x = \cos 2t \text{ where } x(0) = 1, x\left(\frac{\pi}{2}\right) = -1.$$

5. Find the Fourier series to represent, $f(x) = \frac{1}{4}(\pi - x)^2$, where $0 \le x \le 2\pi$

6. Find the inverse Laplace transform of the function, $\cot^{-1}\left(\frac{s}{a}\right)$.

SECTION C

7. Use the concept of residues to evaluate, $\int_0^{2\pi} \frac{dx}{5 - 4\sin x}$

8. A string is stretched and fastened to two points l apart. Motion is started by displacing the string in the form $y = a \sin\frac{\pi x}{l}$ from which it is released at time t = 0.

   Show that the displacement of any point at a distance x from one end at time t is given by $y(x,t) = a \sin\frac{\pi x}{l} \cos\frac{\pi ct}{l}$.

9. Solve in series, $x\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + 2y = 0$.