**Total No. of Questions: 09**

**B.Tech.(3DAnimation & Graphics)(CSE/IT) (2012 Onwards) (Sem. – 3)**

# MATHEMATICS – III

**M Code: 70808**

**Subject Code: BTAM-302**

**Paper ID: [A2143]**

**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) State and prove first shifting theorem for Laplace transforms.

b) Show that an analytic function of constant absolute value is constant.

c) Discuss modified Euler's method.

d) Find the half-range cosine series for the function $f(x) = x^2$ in the range $0 \leq x \leq \pi$.

e) Solve $\sqrt{p}+\sqrt{q}=1$

f) Prove linearity property of Laplace transforms.

g) Find the inverse Laplace transform of $(6 + s)/(s^2 + 6s + 13)$.

h) Write Cauchy-Riemann equations in polar form.

i) Six coins are tossed 6400 times. Using the Poison distribution, determine the approximate probability of getting six heads $x$ times.

j) State Cayley-Hamilton theorem.

**SECTION B**

2. Find Fourier series expansion of $f(x) = x - x^2$ from $x = -\pi$ to $x = \pi$.

   Hence 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 if $L(f(t)) = F(s)$ then $L\left(\frac{f(t)}{t}\right) = \int_s^\infty F(s')\, ds'$ provided the integral exists. Hence evaluate $L\left(\frac{e^{-at} - e^{-bt}}{t}\right)$

4. Show that the function $u(x,y) = e^{ax} \cos by$ is harmonic. Find its conjugate harmonic function $v(x, y)$ and the corresponding analytic function $f(z)$.

5. Using Gauss elimination method solve

   $x - y + z = 1$, $2x + y - z = 2$ and $5x - 2y + 2z = 5$.

6. Two independent samples of sizes 7 and 6 had the following values:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample A | 28 | 30 | 32 | 33 | 31 | 29 | 34 |
| Sample B | 29 | 30 | 30 | 24 | 27 | 28 | – |

   Examine whether the samples have been chosen from normal population having the same variance.

**SECTION C**

7. Solve $(p^2 + q^2)y = qz$.

8. Find the eigen values and the corresponding eigen vectors of $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$

9. Use Runge's method of order four to find an approximate value of y when $x = 0.8$, given that

   $\frac{dy}{dx} = \sqrt{x + y}$; $y(0.4) = 0.4$. (Take $h = 0.2$).