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

**Total No. of Questions : 18**

**B.Tech. (CSE / IT) (2012 to 2017)**
**(Sem.–3)**

# MATHEMATICS – III

**Subject Code : BTAM-302**
**M.Code : 70808**

**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

**Answer briefly :**

1. State and prove second shifting theorem for Laplace transforms.

2. Show that $|z|^2$ is not analytic at any other point except $z = 0$.

3. Discuss modified Euler's method.

4. Find the half-range cosine series for the function $f(x) = (x - 1)^2$ in the interval $0 \le x \le 1$.

5. Solve $pq = p + q$.

6. Evaluate $L(e^{at} \sin bt)$.

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

8. Write Cauchy-Riemann equations in polar form.

9. In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.

10. State Cayley-Hamilton theorem.

## SECTION-B

11. Find Fourier series expansion of $f(x) = x + x^2$ in the interval $-\pi < x < \pi$. Hence show that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + .... = \frac{\pi^2}{12}$.

12. Show that if $L(f(t)) = F(s)$ then $L(t^n f(t)) = (-1)^n \frac{d^n}{ds^n} F(s)$ where n = 1, 2, 3, …….. Hence evaluate L ($t^3 e^{-3t}$).

13. If $f(z)$ is an analytic function of $z$, prove that :

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^2 = 4 |f'(z)|^2$$

14. Solve

$4x - 3y - 9z + 6w = 0$

$2x + 3y + 3z + 6w = 0$

$4x - 21y - 39z - 6w = -24$

15. The following table shows the distribution of digits in numbers chosen at random from a telephone directory :

| Digits | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 1026 | 1107 | 997 | 966 | 1075 | 933 | 1107 | 972 | 964 | 853 |

Test whether the digits may be taken to occur equally frequently in the directory.

## SECTION-C

16. Solve $(x^2 - 2yz - y^2)\,p + (xy + zx)\,q = xy - zx$.

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

18. Evaluate $y$ (0.8) using Runge's method of order four, given that $\frac{dy}{dx} = \sqrt{x+y}$; $y$ (0.4) = 0.4 (Take $h = 0.2$).

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**