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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 $0 \leq x \leq 1$.
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
- $$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}.$$

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 $n = 1, 2, 3, \dots$.
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.