Roll No. Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (CE)/(ECE)/(Electrical Engineering & Industrial Control)/ (Electronics & Computer Engg)/(Electronics & Electrical) (2012 to 2017)/ (Electrical & Electronics) (2011 Onwards)/(EE) (2012 Onwards) (Sem.–3)

ENGINEERING MATHEMATICS – III

Subject Code : BTAM-301

M.Code : 56071

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

Solve the following :

1. Find Laplace transform t e^{-4t} sin 3t.
2. Find inverse Laplace transform of $\dfrac{3s+2}{(s+3)^3}$.
3. Find inverse Laplace transform of $\dfrac{e^{-3s}}{s+2}$.
4. Using the value of $\Gamma\left(\dfrac{1}{2}\right) = \sqrt{\pi}$, show that $J_{\frac{1}{2}}(x) = \sqrt{\dfrac{2}{\pi x}}\sin x$.
5. Express $3x^2 + 5x - 6$ in terms of Legendre polynomials.
6. Derive a PDE by eliminating the arbitrary constants a and b from the equation $x^2 + y^2 + (z - b)^2 = a^2$.
7. Solve PDE $(D^2 + DD' - 2D'^2)\, z = 0$.
8. Show that the function $f(z) = \bar{z}$ does not have derivative at any point.
9. If $f(z)$ is an analytic function with constant modulus then $f(z)$ is constant.
10. State Cauchy's Integral Formula.

SECTION-B

11. Find the Fourier series expansion of the function $f(x) = x + \pi$, $-\pi < x < \pi$. Hence show that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots\ldots$

12. Find the solution of the initial value problem using the Laplace transform

    $y'' + 6y' + 13y = e^{-t}$, $y(0) = 0$, $y'(0) = 4$.

13. Find two linearly independent solutions of the differential equation

    $2x^2 y'' + x y' - (x^2 + 1) y = 0$, using Frobenius method.

14. Find the general solution of the partial differential equation $(y + z) p + (x + z) q = x + y$.

15. Evaluate $\oint_C \frac{(z+1)}{z(z-2)(z-4)^3} dz$, $C : |z - 3| = 2$.

SECTION-C

16. a) Write the Fourier cosine series of $f(x) = \begin{cases} -1, & 0 \le x \le 1 \\ 1, & 1 < x \le 2 \end{cases}$.

    b) Let $f(t)$ be a piecewise continuous function on $[0, \infty]$, be of exponential order and periodic with period T. Then $L[f(t)] = \frac{1}{1-e^{-sT}} \int_0^T e^{-st} f(t)\, dt$.

17. a) State and Prove Rodrigue's Formula.

    b) Using the method of separation of variables, solve

$$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial y} + u, \; u(x, 0) = 6e^{-3x}$$

18. Find all Taylor and Laurent series expansions of $f(z) = \frac{1}{(z+1)(z+2)^2}$ about the point $z = 1$.

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.