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

Total No. of Questions : 18

B.Tech. (Automation & Robotics) (2018 Batch) (Sem.–3)

MATHEMATICS-III

Subject Code : BTAR-303-18

M.Code : 76502

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

Write briefly :

1. Define odd function and write Fourier series for an odd function satisfying Dirichlet conditions in the interval (–c,c).
2. Find Laplace inverse transform of $\frac{1}{s^2-3s+2}$.
3. Find Laplace Transform of $t \sin 2t$.
4. Write down the Bessel's equation.
5. Express $f(x) = 2x^2 - x + 1$ in terms of Lagendre function.
6. Form a partial differential equation by eliminating arbitrary functions from $z = f\left(\frac{y}{x}\right)$.
7. Solve the partial differential equation $p \tan x + q \tan y = \tan z$, where $p = \frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$.
8. Evaluate $\int_C \frac{z-3}{z^2+2z+5}$, $C : |z| = 2$.
9. Write down the necessary and sufficient conditions for a function to be analytic.
10. Write down the mathematical function for Triangular wave form.

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SECTION-B

11. Obtain the Fourier series for $f(x) = x \cos x$ in the interval $(-\pi, \pi)$.

12. Solve the differential equation using Method of Laplace transform

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 2y = e^{-t},\ y(0) = 0, y'(0) = 1$$

13. If α and β are the roots of the equation $J_n(x) = 0$, then prove that

$$\int_0^1 x J_n(\alpha x) J_n(\beta x)\, dx = 0, \text{ if } \alpha \neq \beta$$

14. Expand $f(z) = \dfrac{1}{z^2 - 4z + 3}$ in Laurents series for $1 < |z| < 3$.

15. Solve the Partial differential equation

$$\frac{\partial^2 z}{\partial x^2} - 6\frac{\partial^2 z}{\partial x \partial y} + 9\frac{\partial^2 z}{\partial y^2} = 12x^2 + xy$$

SECTION-C

16. a) Find half-range cosine series for $f(x) = x + x^2$ in the interval $[0, \pi]$.

    b) Find the Bilnear transformation which maps $z = 1, i, -1$ onto the points $w = i, 0 - i$.

17. A string is stretched between the fixed points (0, 0) and (l, 0) and released at rest from the initial deflection given by

$$f(x) = \begin{cases} \dfrac{2k}{l}x, & 0 < x < l/2 \\ \dfrac{2k}{l}(l - x), & l/2 < x < l \end{cases}$$

    Find the deflection in the string at anytime t.

18. Solve in series using Frobenius method :

$$2x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + (x^2 + 1)y = 0$$

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.

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