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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Mechnical Engg.) (Sem.–2)

MATHEMATICS-II

Subject Code : BTAM-203-18

M.Code : 76256

Date of Examination : 08-12-2023

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 & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Answer briefly :

a) Define integrating factor. Is it unique for a given differential equation?

b) Give Bernoulli's equation. Explain in brief method to solve it.

c) Solve $ye^{xy}dx + (xe^{xy} + 2y)dy = 0$.

d) Solve in series the differential equation $\frac{d^2y}{dx^2} - y = 0$.

e) Solve $\frac{d^2y}{dx^2} + \frac{1}{x}\frac{dy}{dx} = 0$.

f) Show that an analytic function with constant modulus is constant function.

g) Find the transformation which maps the points —1, i, 1 of the z-plane onto 1, i, –1 of the w–plane, respectively.

h) State Liouville's theorem.

i) Evaluate $\int_C \frac{z^2 - 2z + 1}{(z-1)^2} dz$, where C is $|z| = 2$.

j) Find the Laurent's series expansion of $f(z) = \frac{z}{(z^2-1)(z^2+4)}$ in the region $|z| < 2$.

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SECTION-B

2. a) Solve $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^2 x$.

   b) Solve $(xy^3 + y)dx + 2\{x^2y^2 + x + y^4\}dy = 0$.

3. a) Solve $y - 2px = \tan^{-1}(xp^2)$.

   b) Solve $y = 2px + y^2p^3$.

4. Using the method of variation of parameters, solve $\frac{d^2y}{dx^2} + 4y = \tan 2x$.

5. Solve $x^2 \frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = e^x$.

SECTION-C

6. If $f(z)$ is a regular function of z, prove that

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

7. Find the harmonic conjugate and the analytic function whose imaginary part is $e^{-x}(x\cos y + y\sin y)$.

8. State Cauchy Residue theorem. Hence evaluate $\int_C \frac{z\cos z}{(z-\pi/2)^3} dz$, where C is $|z-1| = 1$.

9. Evaluate : $\int_0^\infty \frac{\cos ax}{x^2+1} dx$.

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.