Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐ Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(AE/CSE/ME) (Sem.–2)

MATHEMATICS-II

Subject Code : BTAM203-18

M.Code : 91959

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

l. Write short notes on :

a) Form a differential equation for the given family of curve $y = ae^{3x} + be^{-2x}$ by eliminating arbitrary constants *a* and *b*.

b) Find the general solution of $(x+2)\frac{dy}{dx} = x^2 + 4x - 9$.

c) For what value of k, the differential equation $\left(1+e^{\frac{kx}{y}}\right)dx + e^{\frac{x}{y}}\left(1-\frac{x}{y}\right) = 0$ is exact.

d) Obtain general solution of differential equation $y = xy' + (y')^2$, where $y' = dy/dx$.

e) Solve $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = 0$.

f) Determine the poles of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$.

g) What do you mean by Mobius transformation?

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h) Show that an analytic function with constant real part is constant.

i) Evaluate $\int_{0}^{1+i} (x^2 - iy)\, dz$ along the straight line $y = x$.

j) Show that for $|z+1| < 1$, $z^{-2} = 1 + \sum_{n=1}^{\infty} (n+1)(z+1)^n$.

SECTION-B

2. a) Solve $y' + 4xy + xy^3 = 0$, where $y' = \dfrac{dy}{dx}$.

   b) Solve the initial value problem $e^x (\cos y\, dx - \sin y\, dy) = 0$; $y(0) = 0$.

3. a) Solve $\left(xy^2 - e^{\frac{1}{x^3}} \right) dx - x^2 y\, dy = 0$.

   b) Solve $yp^2 + (x - y)p = x$, where $p = \dfrac{dy}{dx}$.

4. Using method of variation of parameters, solve $y'' - 2y' + y = e^x \log x$ where $y'' = \dfrac{d^2y}{dx^2}$, $y' = \dfrac{dy}{dx}$.

5. Solve $(1 - 6x)\dfrac{dy}{dx} = y$ in power series.

SECTION-C

6. Use residue theorem to evaluate $\displaystyle\int_{0}^{2\pi} \frac{d\theta}{5 - 4\sin\theta}$.

7. Show that the function $f(z) = |z|^2$ is continuous everywhere but nowhere differentiable except at origin.

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8. Find the mobius transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. Hence find the image of $|z| < 1$ under this transformation.

9. Expand $\dfrac{1}{(z+1)(z+3)}$ as a Laurent series valid for :

a) $1 < |z| < 3$

b) $|z| > 3$.

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