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

Total No. of Questions : 09

B.Tech. (AE/CE/CSE/ECE/ME) (Sem–2)

MATHEMATICS-II

Subject Code : BTAM/203/18

M.Code : 91959

Date of Examination : 15-05-2024

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. Solve :

a) Form the differential equation of the following :

$$y = Ae^{Bx}.$$

b) Define Bernoulli's differential equation with the help of an example.

c) Find the integrating factor of the equation : $xdy + ydx$.

d) Solve $\frac{d^2y}{dx^2} - 5\frac{ay}{dx} + 6y = e^{4x}$

e) Define Legendre's linear differential equation.

f) Show that $f(z) = e^z$ satisfies the C-R equations.

g) Is $w = z^2$ a conformal mapping?

h) Evaluate $\oint_C \frac{e^z}{z-2} dz, C : |z| = 1.$

i) Show that the function ez has an isolated essential singularity atz

j) State Cauchy's residue theorem.

SECTION-B

2. Solve the differential equation : $\sin x\frac{dy}{dx}+y\cos x = x\sin^2 x$.

3. Solve: $p = \tan\left(x-\frac{p}{1+p^2}\right)$, where $p = \frac{dy}{dx}$

4. Solve the differential equation $\frac{d^2y}{dx^2}+\frac{2}{x}\frac{dy}{dx}=\frac{2(\log x)^2}{x^2}$

5. Solve the differential equation $(1-x^2)\frac{\partial^2 y}{\partial x^2}-2x\frac{dy}{dx}+2y=0$, in power of x.

SECTION-C

6. Construct the analytic function $f(z)$ whose real part is $u(x,y) = e^x \cos y + y$, satisfying $f(1) = 2 - i$.

7. Find the bilinear transformation which maps the points $z_1 = 2$, $z_2 = i$ and $z_3 = -2$ into the points $w_1 = 1, w_2 = i$ and $w_3 = -1$ respectively.

8. Obtain the Taylor's or Laurent's series which represent the function $f(z)=\frac{1}{(1+z^2)(z+2)}$ when :

   a) $|z|<1$

   b) $1<|z|<2$

   c) $1<|z|<2$

9. Apply calculus of residues to prove that $\int_0^\infty \frac{dx}{(x^2+a^2)^3}=\frac{\pi}{4a^3}; a>0.$

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.