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

Total No. of Questions : 09

B.Tech. (ME) (Sem–2)

MATHEMATICS-II

Subject Code : BTAM203-18

M.Code : 76256

Date of Examination : 16-06-2023

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. Solve :

a) Find general solution of $y = xy' - (y')^3$.

b) Find Integrating Factor of $(5x^3 + 12x^2 + 6y^2)dx + 6xydy = 0$.

c) Find non-ordinary (singular) points of $(x^2 + 2x)\frac{d^2y}{dx^2} + (x+1)\frac{dy}{dx} - y = 0$.

d) Check exactness of $ye^{xy}dx + (xe^{xy} + 2y)dy = 0$.

e) Solve $x\frac{dy}{dx} + y = x\log x$.

f) Write C-R equations in polar co-ordinates.

g) Show that the function $u = e^{-2xy}(x^2 - y^2)$ is harmonic.

h) Find the image of the region bounded by the lines $x = 0$, $y = 0$, $x = 2$, $y = 1$ under the transformation $w = z + 1 - 2i$.

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

j) State Maximum Modulus Theorem.

SECTION-B

2. a) Find complete solution of the differential equation $(x^3y^2 + x)dy + (x^2y^3 - y)dx = 0$.

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

3. a) Solve $y + px = p^2x^4$.

b) Using the method of variation of parameters, solve $y'' - 2y' + y = e^x \log x$.

4. a) Solve : $\frac{dy}{dx} + 2y = y^2$.

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

5. Solve $(1+x^2)y''+xy'-y=0$ in series about $x - 0$.

SECTION-C

6. a) Show that $f(z) = z|z|$ is not analytic anywhere.

b) Evaluate $\int_C \tan z dz$, where C is $|z| = 1$.

7. a) Prove that if $f(z) = u + iv$ is an analytic function then u and v are harmonic functions.

b) Expand $f(z) = \frac{1}{z^2+4}$ as a Taylor's series about $z = -i$.

8. a) Show that $u = \frac{1}{2}\log(x^2 + y^2)$ is harmonic. Determine its analytic function. Find its conjugate also.

b) Evaluate $\int_C ze^{\bar{z}}dz$ where C is $|z| = 1$.

9. Find the Laurent's series expansion of $f(z) = \frac{1}{z\ (z-1)^2}$ in the region $0 < |z| < 1$ and $0 < |z - 1| < 1$.

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.