

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Agricultural Engg. / Automobile Engg. / Mechanical Engg.)
(Sem.-2)

MATHEMATICS - II

Subject Code : BTAM-203-18

M.Code : 91959

Date of Examination : 18-07-22

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. Write short notes on :

- a) Obtain general solution of differential equation $y = xy' + (y')^2$.
- b) Find Integrating Factor of $(3xy^2 - y^3) dx - (2x^2y - xy^2) dy = 0$.
- c) Find non-ordinary (singular) points of $(1 - 6x)\frac{dy}{dx} = y$.
- d) Solve : $x \cos xy + \sin y \frac{dy}{dx} = 0$.
- e) Solve the differential equation $x \frac{dy}{dx} - y - 2x^3 = 0$.
- f) Test the analyticity of the function $w = \sin z$.
- g) Show that $2x(1 - y)$ can be the imaginary part of an analytic function.
- h) Find the image of $|z| = 2$ under the mapping $w = z + 3 + 2i$.
- i) Evaluate $\int_0^{1+i} (x - y + ix^2) dz$ along the line from $z = 0$ to $z = 1 + i$.
- j) State Cauchy's Integral Theorem.

SECTION-B

2. a) For what value of k , the differential equation

$$\left(1 + e^{\frac{kx}{y}}\right) dx + e^{\frac{x}{y}} \left(1 - \frac{x}{y}\right) dy = 0 \text{ is exact.}$$

b) Solve $x^3 y''' - 3x^2 y'' + 7xy' - 8y = 3x^2 + 8x$.

3. a) Solve the differential equations : $p^2 + 2py \cot x = y^2$.

b) Find the general solution of the equation $y'' + 16y = 32 \sec 2x$; using method of variation of parameters.

4. a) Solve: $y^2 \log y = xyp + p^2$.

b) Find the solution of $xy' + y = y^2$.

5. Solve Legendre Equation $((1-x^2) \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} + m(m+1)y = 0$, m is any real or complex in power series about 0.

SECTION-C

6. a) If $f(z)$ and $\overline{f(z)}$ are both analytic then show that $f(z)$ is constant.

b) Evaluate $\frac{1}{2\pi i} \int_C \frac{z^2 + 5}{z - 3} dz$, where C is $|z| = 4$.

7. a) Prove that $u = x^2 - y^2$ and $v = -\frac{y}{x^2 + y^2}$ are harmonic but $u + iv$ is not regular.

b) Expand $f(z) = \frac{z+1}{(z-3)(z-4)}$ as a Taylor's series about $z = 2$.

8. a) Find the analytic function $f(z) = u + iv$ if $u + v = \frac{x}{x^2 + y^2}$ and $f(1) = 1$.

b) Evaluate $\int_C \frac{e^{2z}}{(z - \pi i)^3} dz$, where C is $|z - 2i| = 2$.

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

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.