

Roll No.

Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (Mechanical Engg.) (2018 & onwards) (Sem.-2)

MATHEMATICS-II

Subject Code : BTAM-203-18

M.Code : 76256

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

Answer briefly :

- 1) Define Bernoulli's equation with an example.
- 2) Solve : $p^2 - 7p + 12 = 0$.
- 3) Solve : $(y \cos x + 1) dx + \sin x dy = 0$.
- 4) Write Clairaut's equation with example.
- 5) What is the significance of integrating factor.
- 6) Check the analyticity of $\log z$, where $z = x + iy$.
- 7) Define conformal mapping.
- 8) Expand $f(z) = \frac{z}{(z+1)(z+2)}$ about $z = -2$.
- 9) State Cauchy Integral formula.
- 10) Evaluate, $\oint_C \frac{e^z}{(z+1)^2} dz$ along the circle $C : |z - 3| = 3$.

SECTION-B

- 11) a) Find the power series solution about the origin of the equation

$$(1 - x^2) y'' - 2xy' + 6y = 0$$

b) Solve $(2x \log x - xy) dy + 2y dx = 0$.

- 12) a) Solve $ye^y dx = (y^3 + 2xe^y) dy$.

b) Solve : $(xy^2 + 2x^2y^3) dx + (x^2y - x^3y^2) dy = 0$.

- 13) Solve by method of variation of parameters :

$$(D^2 + 2D + 1) y = 4e^{-x} \log x.$$

14) Solve : $x^2 \frac{d^3 y}{dx^3} + 3x \frac{d^2 y}{dx^2} + \frac{dy}{dx} = x^2 \log x$

SECTION-C

- 15) a) Show that function $f(z)$ defined by $f(z) = \frac{x^2 y^3 (x + iy)}{x^6 + y^{10}}$, $z \neq 0$, $f(0) = 0$, is not analytic at the origin even though it satisfies C-R equations.

- b) Find the bilinear transformation that map the points $z = 1, i, -1$ into the points $w = i, 0, -i$.

- 16) a) Determine the analytic function whose real part is $e^{2x} (x \cos 2y - y \sin 2y)$.

- b) Prove that $u = e^{-2xy} \sin (x^2 - y^2)$ is harmonic. Find a function v such that $f(z) = u + iv$ is analytic. Also express $f(z)$ in terms of z .

- 17) a) Use the concept of residues to evaluate $\int_0^{2\pi} \frac{dx}{5 - 4 \sin x}$.

b) Evaluate $\oint_C \frac{z-3}{(z^2+2z+5)} dz$ along the circle $C : |z + 1 - i| = 2$.

- 18) Expand $f(z) = \frac{(z-2)(z+2)}{(z+1)(z+4)}$ in the following given regions :

- a) $|z| < 1$, b) $1 < |z| < 4$, c) $|z| > 4$.

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.