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

Total No. of Questions : 18

B.Tech. (Mechnical Engg/Automobile Engg./ Civil Engg./CSE/ECE/Electrical & Electronics 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 $f(z) = \dfrac{z}{(z+1)(z+2)}$ about $z = -2$.

9) State Cauchy Integral formula.

10) Evaluate, $\oint_C \dfrac{e^z}{(z+1)^2} dz$ 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 $(2x \log x - xy)\, dy + 2ydx = 0$.

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

SECTION-C

15) a) Show that function $f(z)$ defined by $f(z) = \frac{x^2y^3(x+iy)}{x^6+y^{10}}$, $z \neq 0, f(0) = 0$, 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.