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Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (Mechanical Engg) (2018 &amp; 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. Solve  $y (\log y) dx + (x - \log y) dy = 0$ .
2. Solve  $p = \log (px - y)$ .
3. Find the particular integral of  $(D^2 - 2D + 4)y = e^x \cos x$ .
4. Solve  $(D^2 + 1)^3 = 0$ .
5. What is the necessary and sufficient condition for a differential equation to be exact?
6. Define analytic function.
7. Evaluate  $\oint_C (x^2 - y^2 + 2ixy) dz$  where C is the contour  $|z| = 1$ .
8. State maximum modulus theorem.
9. Find all zeros of  $\sin z$ .
10. What is the principal value of  $i^i$ ?



**SECTION-B**

11. Solve :

a)  $x \frac{dy}{dx} + y = x^3 y^6$ .

b) Solve  $(xy^3 + y) dx + 2(x^2 y^2 + x + y^4) dy = 0$ .

 12. Solve  $y = 2px + y^2 p^3$ 

 13. a) Using method of variation of parameters, solve  $\frac{d^2 y}{dx^2} + 4y = \tan 2x$ .

b) Solve  $y'' - 2y' + 5y = 0$  if  $y(0) = -3$ ,  $y'(0) = 1$ .

 14. Solve  $x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + y = \log x \frac{\sin(\log x) + 1}{x}$ .

**SECTION-C**

 15. Show that the function  $u = e^{-2xy} \sin(x^2 - y^2)$  is harmonic. Find conjugate function  $v$  and express  $u + iv$  as an analytic function of  $z$ .

16. Derive Cauchy Riemann equations for analytic functions.

 17. a) Evaluate  $\int_{1-i}^{2+3i} (z^2 + z) dz$  along the line joining the points  $(1, -1)$  and  $(2, 3)$ .

b) By integrating around a unit circle evaluate  $\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4 \cos \theta} d\theta$ .

 18. Evaluate  $\frac{1}{z^2 - 3z + 2}$  in the region.

a)  $|z| < 1$

b)  $1 < |z| < 2$

c)  $|z| > 2$

d)  $0 < |z - 1| < 1$

**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.**