

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Mechanical Engg) (2018 Batch) (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

I. Answer briefly :

- a) Give an example of exact differential equation.
- b) Find the particular integral of $(D^2 + 3D + 2)y = 5$.
- c) Define analytic function.
- d) Evaluate $(1 + i)^{(1-i)}$.
- e) Is $\cos(z)$ a bounded function? Justify.
- f) State Cauchy residue theorem.
- g) State Liouville's theorem.
- h) Find the particular integral of $(4D^2 + 4D - 3)y = e^{2x}$.
- i) Classify the singular points of $x^2y''' - xy' + (x^2 - n^2)y = 0$, n is constant.
- j) Define singular point of a differential equation.

SECTION-B

2. a) Solve $x \frac{dy}{dx} - y \log(y) - xy e^x = 0$. (4)
- b) Find the values of C such that $(2xe^y - 3y^2) \frac{dy}{dx} - (3x^2 - e^y) = 0$ is exact. Further, for this value of C , solve the equation. (4)

3. a) Solve $p^2x(x-2) + p(2y-2xy-x+2) + y^2 + y = 0$. (4)
 b) Solve $y^2 \log y = xpy + p^2$. (4)
4. a) Solve by the method of variation of parameters $y'' - y = \operatorname{cosec}(x)$. (4)
 b) Solve $\frac{d^2y}{dx^2} - \frac{1}{x} \frac{dy}{dx} - \frac{12 \log x}{x^2}$. (4)
5. a) Find the series solution about $x = 0$ of the equation $xy'' - y' - xy = 0$, by the Frobenius method. (4)
 b) Find the regular and singular points of the differential equation : (4)
- $$(1-x^2)y'' - 2xy' + n(n+1)y = 0$$

SECTION-C

6. a) Using Cauchy-Riemann equations, show that the function $f(z) = |z|^2$ is not analytic at any point. (4)
 b) Prove that the function $f(z) = \cos z$ is analytic in the finite z -plane. (4)
7. a) Show that the function $v(x, y) = x^2 \sin y$ is harmonic. Find the conjugate function $u(x, y)$ and the corresponding analytic function $f(z)$. (4)
 b) Discuss the transformation $w = \sin z$. (4)
8. a) Evaluate $\int_C \frac{dz}{(z-1)^4}$, where C is the circle $|z| = 2$ using Cauchy integral formula. (4)
 b) Expand the function $f(z) = \frac{1}{z(z-1)(z-2)}$, for $|z| > 2$ using Laurent's series. (4)
9. a) Determine the poles of the function $f(z) = \frac{z-1}{z^2(z-2)}$ and find the residue at each pole. (4)
 b) Apply Cauchy Residue theorem to evaluate $\int_0^{2\pi} \frac{d\theta}{2+\cos \theta}$. (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.