

Roll No.

Total No. of Pages : 02

Total No. of Questions : 18

B.Tech (Civil Engg.) (2018 & Onwards) (Sem.-2)

**MATHEMATICS-II**

Subject Code : BTAM-201-18

M.Code : 76254

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) Is this differential equation  $\frac{d^2y}{dx^2} + a^2x = 0$  linear?
- 2) Is this differential equation  $x^2 y dx - (x^3 + y^3) dy = 0$  exact?
- 3) Write the solution of the Clairaut's equation  $y = px + \sin^{-1} p$ .
- 4) Find the wronskian from  $\frac{d^2y}{dx^2} + 4y = \tan 2x$ .
- 5) Find complementary function of  $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x$ .
- 6) Find particular integral of  $\frac{\partial^2 z}{\partial t^2} - a^2 \frac{\partial^2 z}{\partial x^2} = E \sin pt$ .
- 7) Write one dimensional wave equation.
- 8) Classify the equation  $(x + 1) u_{xx} - 2(x + 2)u_{xy} + (x + 3) y_{yy} = 0$ .
- 9) What is a boundary value problem?
- 10) Write Laplace equation in cylindrical coordinates.

### SECTION-B

- 11) Solve a)  $[1+\log(xy)]dx + \left[1+\frac{x}{y}\right]dy = 0$ .
- b)  $x\left(\frac{dx}{dy} + y\right) = 1 - y$ .
- 12) a) Solve  $(D^2 - 6D + 9)y = 6e^{3x} + 7e^{-2x} - \log 2$ .
- b) Find the power series solution of the differential equation  $(4x D^2 + 2D + 1)y = 0$ .
- 13) Solve a)  $p\sqrt{x} + q\sqrt{y} = \sqrt{z}$ .
- b)  $x^2p + y^2q = z(x + y)$ .
- 14) a) Solve the PDE  $(D^2 - 2DD' + D'^2)z = e^{x+y}$ .
- b) Solve the PDE  $(D + D')(D - 2D' + 2)z = \sin(2x + y)$ .

### SECTION-C

- 15) Solve  $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$  by method of separation of variables. Given that  $u = 3e^{-x} - e^{-5y}$  when  $x = 0$ .
- 16) Solve the BVP  $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$  using D' Alembert's technique subject to the conditions  $u = P_0 \cos pt$  when  $x = l$  and  $u = 0$  when  $x = 0$ .
- 17) Solve the BVP  $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$  using separation of variables method subject to the conditions  $u(0, t) = u(l, t) = 0$ ,  $u(x, 0) = x$  where  $l > 0$ .
- 18) The diameter of a semi-circular plate of radius  $a$  is kept at  $0^\circ\text{C}$  and the temperature at the semicircular boundary is  $T^\circ\text{C}$ . Estimate the steady state temperature in the plate using the Laplace equation  $r^2 \frac{\partial^2 u}{\partial r^2} + r \frac{\partial u}{\partial r} + \frac{\partial^2 u}{\partial \theta^2} = 0$ .

**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.**