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 $x^2\,ydx - (x^3 + y^3)\,dy = 0$ 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 $u=3e^{-y}-e^{-5y}$ 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 0ºC and the temperature at the semicircular boundary is TºC. 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.