Roll No. Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Civil) (2018 Batch) (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

l. **Answer briefly :**

a) What is an exact differential equation? Give example.

b) Solve $p(1 + q) = qz$.

c) Classify the differential equation $u_{xx} + u_{yy} = f(x, y)$.

d) Classify the singular points of $x^2y'' + xy' + (x^2 - n^2) = 0$, n is constant.

e) Define ordinary point of a differential equation.

f) Write Laplace equation in spherical coordinates.

g) Show that e^{-x} and xe^{-x} are independent solutions of $y'' + 2y' + y = 0$ in any interval.

h) Is $xu_x + yu_y = u^2$ a nonlinear partial differential equation?

i) Write an example of linear differential equation of first order.

j) Give an example of elliptic partial differential equation.

SECTION-B

2. a) The initial value problem governing the current i flowing in a series RL circuit when a voltage $v(t) = t$ is applied, is given by $iR + L\frac{di}{dt} = t$, $t \geq 0$, $i(0) = 0$, where R and L are constants. Find the current $i(t)$ at any time t. (4)

b) Solve $(x^2D^2 + 7xD + 13)\, y = \log(x)$ (4)

3. a) Solve by the method of variation of parameters $y'' - 2y' + y = e^x \tan(x)$. (4)

b) Obtain the series solution of the equation $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - 4)y = 0$. (4)

4. a) Solve $(3D^2 - D')u = \sin(2x + 3y)$. (4)

b) Find the complete solution of $(D^3 + D^2D' - DD'^2 - D'^3)z = e^x \cos 2y$. (4)

5. a) Solve the partial differential equation $(mz - ny)\frac{\partial z}{\partial x} + (nx - lz)\frac{\partial z}{\partial y} = ly - mx$. (4)

b) Find the general solution of partial differential equation : (4)

$$4\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 16 \log(x + 2y)$$

SECTION-C

6. a) Classify the partial differential equation $(1 + y^2)\, u_{xx} + (1 + x^2)u_{yy} = 0$ for different values of x and y. (4)

b) Solve the equation $\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}, u(0, y) = 8e^{-3y}$ using method of separation of variables.(4)

7. a) Derive D'Alembert's solution of one dimensional wave equation. (4)

b) Find the deflection of a vibrating string of unit length having fixed ends with initial velocity zero and initial deflection $f(x) = a(x - x^2)$. (4)

8. An insulated rod of length l has its end A and B maintained at 0°C and 100°C, respectively until steady state conditions prevail. If B is suddenly reduced to 0°C and maintained at 0°C, find the temperature at a distance x from A at time t. (8)

9. Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions $u(0, y) = u(l, y) =$ $(x, 0) = 0$ and $u(x, a) = \sin(n\pi x/l)$. (8)

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.