**B.Sc. Part—I Semester—II (Old) Examination**

**MATHEMATICS**

**(Differential Equation : Ordinary & Partial)**

**Paper—III**

Time : Three Hours] [Maximum Marks : 60

**Note :**— (1) Question No. **1** is compulsory. Attempt it once only.

(2) Attempt **ONE** question from each Unit.

1. Choose the correct alternative :

(1) A necessary condition for $M(x, y)dx + N(x, y)dy = 0$ to be exact is :

(a) $Mx = Ny$ (b) $Ny = Nx$

(c) $My = Nx$ (d) $Mx \neq Ny$

(2) A linear DE of first order is of the form $y' + Py = Q$ in which :

(a) P is a function of y

(b) P and Q are functions of x

(c) P is a function of x and Q is a function of y

(d) None of these

(3) The P.I. of the PDE $(2D - 3D')z = e^{x-y}$ is :

(a) $\frac{1}{5}e^{x-y}$ (b) $-\frac{1}{5}e^{x-y}$

(c) $e^{x-y}$ (d) $-e^{x-y}$

(4) The solution of PDE $(D - mD')z = 0$ is :

(a) $z = f(y + mx)$ (b) $z = f(y - mx)$

(c) $z = f(e^{xy})$ (d) None of these

(5) The roots of DE $(D - 1)(D + 2)(D + 3)y = 0$ are :

(a) Real and equal (b) Imaginary

(c) Real and distinct (d) Complex

(6) The order of the DE $\frac{d^3y}{dx^3} = 4\sqrt{y + \left(\frac{dy}{dx}\right)^5}$ is :

(a) 4 (b) 3

(c) 1 (d) 5

(7) Lagrange's form of the PDE of order one is :

(a) $P_p + Q_q = R$ (b) $P_p - Q_q = R$

(c) $P_q + Q_p = R$ (d) None of these

(8) The particular solution of DE $W'' + PW' + QW = 0$ is $y = x$ if :

(a) $1 + P + Q = 0$ (b) $1 - P + Q = 0$

(c) $m^2 + mP + Q = 0$ (d) $P + XQ = 0$

(9) The general solution of the PDE $f(D, D')z = 0$ is :

(a) C.F. only (b) P.I. only

(c) C.F. and P.I. both (d) None of these

(10) The complete integral of $F(x, p) = G(y, q)$ is :

(a) $z = \int h(x, a)dx$ (b) $z = \int k(y, a)dy$

(c) $z = \int h(x, a)dx + \int k(y, a)dy$ (d) None of these $1\times10=10$

## UNIT—I

2. (a) Show that the DE $xdx + ydy = a^2 \frac{xdy - ydx}{x^2 + y^2}$ is exact and solve it. 5

(b) Solve the DE $(1 - x^2)\frac{dy}{dx} + 2xy = x(1 - x^2)^{1/2}$. 5

3. (p) Solve the DE $(1 + y^2)dx = (\tan^{-1}y - x)dy$. 5

(q) Solve the DE $\cos x\, dy = y(\sin x - y)dx$. 5

## UNIT—II

4. (a) Solve DE $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = \cos 3x$. 5

(b) Solve DE $(x^2D^2 - 3xD + 5)y = x^2\sin(\log x)$. 5

5. (p) Solve DE $(x + a)^2\frac{d^2y}{dx^2} - 4(x + a)\frac{dy}{dx} + 6y = x$. 5

(q) Solve DE $(D^2 - 4D + 4)y = e^{2x} + \sin 2x$. 5

## UNIT—III

6. (a) Find particular solution of $y'' - 2y' + y = 2x$ by variation of parameter method. 5

(b) Solve DE by changing the independent variable :

$$x^6y'' + 3x^5y' + a^2y = \frac{1}{x^2}.$$ 5

7. (p) Solve $\frac{dx}{dt} + 2\frac{dy}{dt} - 2x + 2y = 3e^t$ and $3\frac{dx}{dt} + \frac{dy}{dt} + 2x + y = 4e^{2t}$. 5

(q) Solve DE $(x \sin x + \cos x)\frac{d^2y}{dx^2} - x \cos x \frac{dy}{dx} + y \cos x = 0$ by the method of change of dependent variable. 5

**UNIT—IV**

8. (a) Solve DE $p^2 + q^2 = x^2 + y^2$. 5

(b) Find the general integral of PDE $z(xp - yq) = y^2 - x^2$. 5

9. (p) Find the complete integral of PDE $yp = zyx + \log q$. 5

(q) Find general integral of $(mz - hy)p + (nx - lz)q + mx - ly = 0$. 5

**UNIT—V**

10. (a) Solve PDE $(r - 3s + 2t) = e^{2x + 3y} + \sin(x - 2y)$. 5

(b) Apply Charpit's method to solve PDE $z^2 = pqxy$. 5

11. (p) Solve PDE $(D^2 - D')z = xe^{x + y}$. 5

(q) Solve PDE $p^2 - x = q^2 - y$. 5