B.Sc. Part—I Semester—II (Old) Examination
MATHEMATICS
(Differential Equation : Ordinary & Partial)

Time : Three Hours] [Maximum Marks : 60

Note :— (1) Question No. **1** is compulsory and solve it in **one** attempt only.
(2) Attempt **ONE** question from each Unit.

1. Choose the correct alternative :

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

(a) 4 (b) 3
(c) 1 (d) 5

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

(a) Mx = Ny (b) My = Nx
(c) Ny = Nx (d) Mx ≠ Ny

(3) The DE of the form $\frac{dy}{dx} + Py = Qy^n$ is called :

(a) Linear equation (b) Bernoulli's equation
(c) Homogeneous DE (d) Clairaut's equation

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

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

(5) The particular solution of the 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

(6) 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

(7) The roots of DE (D – 1) (D – 2) (D – 3)Y = 0 are :

(a) Real and distinct (b) Real and equal

(c) Imaginary (d) Complex

(8) The C.F. of the DE $y'' - y = \frac{2}{1+e^x}$ is :

(a) $c_1e^x + c_2e^{-x}$ (b) $c_1e^x + c_2e^{2x}$

(c) $c_1e^{-x} + c_2e^{2x}$ (d) None of these

(9) The equations f(x, y, p, q) = 0 and g(x, y, p, q) = 0 are compatible if :

(a) $J_{xp} + J_{yq} = 0$ (b) $J_{xq} + J_{yp} = 0$

(c) $J_{xp} - J_{yq} = 0$ (d) None of these

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

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

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

UNIT—I

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

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

3. (p) Show that the DE $(\sin x \sin y - xe^y)dy = (e^y + \cos x \cos y)dx$. 5

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

UNIT—II

4. (a) Solve DE $(x^2D^2 - 3xD + 4)y = 2x^2$. 5

(b) Solve DE $(D^2 + 2D + 1)y = \cos 3x$. 5

5. (p) Solve DE $(D^2 + q^2)y = x \cos ax$. 5

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

UNIT—III

6. (a) Solve DE $x^6y'' + 3x^5y' + a^2y = \frac{1}{x^2}$ by changing the independent variable. 5

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

7. (p) Solve DE $y'' + h^2y = \text{cosec } hx$ by variation of parameter. 5

(q) Solve $\frac{dx}{dt} + 7x - y = 0; \frac{dy}{dt} + 2x + 5y = 0$. 5

UNIT—IV

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

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

9. (p) Find the general solution of $p + 3q = 5z + \tan (y - 3x)$. 5

(q) Find the general integral of

$(mz - hy)p + (hx - \ell z)q + mx - \ell y = 0$. 5

UNIT—V

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

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

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

(q) Show that the equation $xp - yq = x$ and $x^2p + q = xz$ are compatible and find their solution. 5

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