Roll No. ....

V – 6161

B. C. A. (Fifth Semester)

EXAMINATION, Nov./Dec., 2019

Paper – 501

DIFFERENTIAL EQUATIONS

Time : Three Hours

Maximum Marks : 80 (For Regular Students)

Minimum Pass Marks : 32

Note– Selecting any *two* parts from each question attempt *all* questions. All questions carry equal marks.

1. (i) Solve–

$$x\frac{dy}{dx}+y=y^2\log x$$

(ii) Solve–

$$(1+4xy+2y^2)dx+(1+4xy+2x^2)dy=0$$

(iii) Solve–

$$x^2+p^2x-yp=0$$

P.T.O.

2. (i) Solve–

$$(D^3+1)=(e^x+1)^2$$

(ii) Solve–

$$\frac{d^2y}{dx^2}+4y=\sin^2 x$$

(iii) Solve–

$$\frac{d^2y}{dx^2}+y=\operatorname{cosec} x$$

3. (i) Form a partial differential equation by eliminating arbitrary constants a and b from the equation–

$$z=(x^2+a)(y^2+b)$$

(ii) Solve–

$$x^2(y-z)p+(z-x)y^2q=z^2(x-y)$$

(iii) Solve by Charpit's method–

$$q=px+p^2$$

4. (i) Solve–

$$\frac{\partial^2 z}{\partial x^2}-2\frac{\partial^2 z}{\partial x\partial y}+\frac{\partial^2 z}{\partial y^2}=12xy$$

(ii) Solve one dimensional heat equation by the method of separation of variable–

$$\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$$ with boundary conditions :

$u(0,t) = 0, \quad u(l,t) = 0, \forall t,$

and initial condition :

$u(x,0) = f(x).$

(iii) Solve the boundary value problem by the method of separation of variables :

$$\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2} \; (0 < x < c, t > 0)$$

$y(0,t) = 0, \; y(c,t) = 0,$

$y_t(x,0) = 0, \; y(x,0) = f(x) \; (0 \le x \le c)$

where $f(x)$ is continuous in $0 \le x \le c$ and $f(0) = f(c) = 0$

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5. (i) Solve by power series method–

$$\frac{d^2 y}{dx^2} + y = 0$$

(ii) Prove that–

$$x J_n'(x) = -n J_n(x) + x J_{n-1}(x)$$

(iii) Prove that–

$$n P_n = x P_n' - P_{n-1}'$$