## NKT/KS/17/5078

[Maximum Marks: 60

# Bachelor of Science (B.Sc.) Seme ster—II (C.B.S.) Examination MATHEMATICS Compulsory Paper—1 (M, Geometry, Differential and Difference Equations)

Time : Three Hours]

- **N.B.** :— (1) Solve all the **FIVE** questions.
  - (2) All questions carry equal marks.
  - (3) Question Nos. 1 to 4 have an alternative. Solve each question in full or its alternative in full.

## UNIT—I

- 1. (A) Find the equation of the sphere which passes through the points (1, 0, 0), (0, 1, 0), (0, 0, 1) and has its radius as small as possible. 6
  - (B) Show that the plane lx + my + nz = p will touch the sphere  $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ , if  $(u^2 + vm + wn + p)^2 = (l^2 + m^2 + n^2) (u^2 + v^2 + w^2 - d)$ .

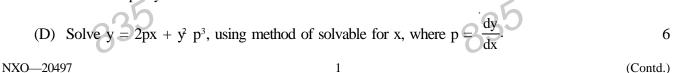
# OR

(C) Find the equation of the right circular cone which passes through the point (1, 1, 2) and has its vertex at the origin and axis the line  $\frac{x}{2} = \frac{-y}{4} = \frac{z}{3}$ .

(D) Find the equation of the right circular cylinder of radius 2 and whose axis is the line  $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{2}.$ 6

### UNIT—II

2. (A) Prove that the general solution of the linear differential equation dy/dx + Py = Q, where P and Q are functions of x or constants, is given by ye<sup>∫Pdx</sup> = ∫Qe<sup>∫Pdx</sup>dx + c and hence solve dy/dx + y tan x = sec x.
(B) Solve (x<sup>2</sup> + y<sup>2</sup>) dx + xy dy = 0 by finding integrating factor.
(C) Solve p - 1/p = x/y - y/x, where p = dy/dx.



#### UNIT—III

3. (A) Solve 
$$(D^2 + 3D - 4)y = x e^{2x}$$
, where  $D = \frac{d}{dx}$ .

(B) Solve 
$$x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = \log x.$$
 6

### OR

- (C) Solve  $xy^{(2)} (2x 1)y^{(1)} + (x 1)y = 0$  for which  $y = e^x$  is an integral. 6
- (D) Solve  $y^{(2)} + 4y = \csc 2x$  by using method of variation of parameters. 6

## UNIT—IV

- 4. (A) From the relation  $u_x = c_1 3^x + c_2 (-1)^x$ , derive the difference equation by eliminating the arbitrary constants  $c_1$  and  $c_2$ .
  - (B) Solve  $u_{x+2} 3u_{x+1} + 2u_x = 4^x$ , given that  $u_0 = 0$ ,  $u_1 = 1$ . 6

#### OR

- (C) Solve  $u_{x+2} 7u_{x+1} + 10 u_x = 12.4^x$ . 6
- (D) Solve  $u_{x+2} + u_x = \sin(x/2)$ . 6

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- 5. (A) Find the equation of the sphere through the circle  $x^2 + y^2 + z^2 = 9$ , 2x + 3y + 4z = 5 and the point (1, 2, 3).
  - (B) Prove that the semivertical angle of a right circular cone admitting sets of three mutually perpendicular generator is  $\tan^{-1}\sqrt{2}$ .

(C) Reduce the equation 
$$\frac{dy}{dx} - \frac{1}{x} \tan y = x^2 \sec y$$
 to the linear form.  $1\frac{1}{2}$ 

- (D) Solve  $p = \sin (y xp)$ , where  $p = \frac{dy}{dx}$ . 1<sup>1</sup>/<sub>2</sub>
- (E) Find the particular integral of  $(D^2 4D + 3)y = e^{3x}$ .  $1\frac{1}{2}$
- (F) Solve  $(D^3 D^2 12D) y = 0.$  1<sup>1</sup>/<sub>2</sub>
- (G) Solve  $u_{x+3} 3u_{x+1} 2u_x = 0.$  1<sup>1</sup>/<sub>2</sub>

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(H) Write the difference equation  $(\Delta^2 + 2\Delta + 5)u_x = 0$  in E-form.

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