PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2017
(Second Semester)

Branch – **MATHEMATICS**

DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

Time : Three Hours Maximum : 75 Marks

SECTION-A (20 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 2 = 20)

1 Solve $\left(x^2 + y^2\right)(xdx + ydy) = a^2(xdy - ydx)$.

2 Solve $x^2p^2 + 3xyp + 2y^2 = 0$.

3 Solve $\left(D^3 - 3D^2 + 4\right)y = 0$.

4 Solve $\left(D^2 + 5D + 6\right)y = e^x$.

5 Solving the equation $\frac{dx}{-y^2 - z^2} = \frac{dy}{xy} = \frac{d^2}{x^2}$.

6 Solve $\left(D^2 - 3\right)x - 4y = 0$; $(D^2+1)y + x = 0$.

7 Find L $\left(te^{-at}\right)$.

8 Find L $\left(\frac{l - e^t}{t}\right)$.

9 Find $L^{-1}\left[\frac{1}{s-3} + \frac{1}{s} + \frac{s}{s^2 - 4}\right]$.

10 Find $L^{-1}\left[\frac{1}{s(s+3)}\right]$.

SECTION - B (25 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 5 = 25)

11 a Solve $(x^2y - 2xy^2)\,dx - (X^3 - 3x^2y)\,dy = 0$.

OR

b Solve $x = P^{2+}y$.

12 a Solve $(D^3 - D^2 - D + 1)\,Y = 1 + x^2$.

OR

b Solve the equation $(D^2 + 2D + 1)\,y = e^{-x} + 3$.

13 a Solve $\frac{d^2x}{dt^2} + 2\frac{dy}{dt} - x + \sin t = 0$

$\frac{d^2y}{dt^2} - 2\frac{dx}{dt} - y + \cos t = 0$

OR

b Solve the equation $\frac{dx}{xy} = \frac{dy}{y^2} + \frac{dz}{x(yz - 2x)}$.

Cont...

14 a Find L $(\sin^3 3t + \cos h^3 3t)$.

OR

b Find L $\left(\frac{\sin 4t}{t}\right)$ and L $\left(\frac{e^{3t}}{2t}\right)$.

15 a Find $L^{-1}\left[\frac{s-3}{s^2+4s+13}\right]$.

OR

b Find $L^{-1}\left[\frac{1+2s}{(S+2)^2(S-1)^2}\right]$

SECTION - C (30 Marks)

Answer any **THREE** Questions

ALL Questions Carry **EQUAL** Marks (3 x 10 = 30)

16 Solve $3P^2e^y - px + 1 = 0$.

17 Solve the equation $(D^2+6D+8)\ Y = e^{-2x}+\cos^2 X$

18 Solve the simultaneous equations

$$\frac{dx}{dt} + 2y + \sin t = 0,$$

$$\frac{dy}{dt} - 2x - \cos t = 0.$$

19 Find (i) L $\left(\frac{\cos at}{t}\right)$

(ii) L $\left(\frac{e^{at} - \cos 6t}{t}\right)$

20 Solve the simultaneous equations

$$\frac{dx}{dt} - \frac{dy}{dt} - 2x + 2y = 1 - 2t$$

$$\frac{d^2x}{dt^2} + 2\frac{dy}{dt} + x = 0$$

With the conditions x = 0, y = 0, $\frac{dx}{dt} = 0$ when t = 0.

Z-Z-Z END