(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2017

(First Semester)

Branch – **MATHEMATICS WITH COMPUTER APPLICATIONS**

DIFFERENTIAL EQUATIONS LAPLACE TRANSFORMS & FOURIER SERIES

Time : Three Hours Maximum : 75 Marks

SECTION-A (20 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 x 2 = 20)

1 Solve $y = (x - a)p - p^2$.

2 Find the complementary function of $(D^2 - 8D + 9)y = 8 \sin 5x$.

3 Eliminate the constants a and b from $z = ax + by + a$.

4 Solve the equation $pq = k$.

5 Prove that $L\{f(t) + \phi(t)\} = L\{f(t)\} + L\{\phi(t)\}$.

6 Find $L[at^2 + bt + c]$.

7 Find $L^{-1}\left[\frac{1}{(s+2)^2+16}\right]$.

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

9 Define Fourier series of a function.

10 Write the properties of odd function and even function in a Fourier series.

SECTION - B (25 Marks)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks (5 x 5 = 25)

11 a Solve $p^2 + 2yp \cot x = y^2$.

OR

b Solve $(D^3 - D^2 - D + 1)\, y = 1 + x^2$.

12 a Eliminate the functions f and ϕ from the relation $z = f(x + ay) + \phi\,(x - ay)$.

OR

b Solve $p(1+q^2) = q(z-1)$.

13 a Find $L[\sin^2 2t]$.

OR

b Find the Laplace transform of $f(t) = e^{-t}$ when $0 < t < 4$;
$= 0$ when $t > 4$.

14 a Find $L^{-1}\left[\log\frac{s+1}{s-1}\right]$.

OR

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

Cont ....

15 a Express $f(x) = x \; (-\pi < x < \pi)$ as a Fourier series with the period 2π.

OR

b If $f(x) = x$ when $0 < x < \frac{\pi}{2}$

$= \pi - x$ when $x > \frac{\pi}{2}$,

then expand f(x) as a sine series in the interval $(0, \pi)$.

SECTION - C (30 Marks)

Answer any **THREE** Questions

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

16 Solve $x^2 \frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = \frac{1}{(1-x)^2}$.

17 i) Solve $p = y^2q^2$

ii) Solve $p + q = \sin x + \sin y$.

18 Find i) $L[t\, e^{-t} \sin t]$ ii) $L\left[\frac{\sin at}{t}\right]$.

19 Solve $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} - 5y = 5$, given that $y = 0$, $\frac{dy}{dt} = 2$ at $t = 0$.

20 Express $f(x) = \frac{1}{2}(\pi - x)$ in the interval $(0, 2\Pi)$ as a Fourier series with the period 2π.

Z-Z-Z END