14MAU07

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2018
(Third Semester)

Branch – **MATHEMATICS**

PARTIAL DIFFERENTIAL EQUATIONS AND FOURIER TRANSFORMS

Time : Three Hours Maximum : 75 Marks

SECTION-A (20 Marks)

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

1 Find the differential equation of all spheres whose centres lie on the z-axis.

2 Solve $\frac{\partial^2 z}{\partial y^2} = \sin y$

3 Write the auxiliary equation of px+qy=z.

4 Find the complete integral of p=2qx.

5 Define even and odd functions.

6 State Dirchelet's conditions.

7 State Fourier integral theorem.

8 Find the theorem transform of $f(x)=e^{ikx}$, a<x<b
=0, x<a and x>b

9 State Inversion formula for sine transform.

10 Find fourier sine and cosine transforms of $f^1(x)$.

SECTION - B (25 Marks)

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

11 a Solve $p^2+q^2=x+y$

OR

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

12 a Solve $(y^2+z^2)p-xyq=-xz$

OR

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

13 a Find a sine series for f(x)=c in the range 0 to π

OR

b Expand $\pi - x \ (0 < x < \pi)$ as a half range cosine series.

14 a State and prove Inversion theorem for complex fourier transform.

OR

b Find fourier cosine transform of $\frac{1}{a^2 + x^2}$.

15 a Find the finite fourier sine transforms of $f(x)=x^2$ in (0, l)

OR

b Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ for x>0,t>0 given that

(i) u(0,t) = 0 for t>0
(ii) u(x,0) = 1 for 0<x<1
0 for x≥1

and (iii) u(x,t) is bounded.

SECTION - C (30 Marks)

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

16 Solve $z = px + qy + \sqrt{1 + p^2 + q^2}$

17 Solve $p^2+q^2-2px-2qy+1=0$

18 Show that $x^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty}(-1)^n \frac{\cos nx}{n^2}$ in the interval $(-\pi \le x \le \pi)$

19 Find the fourier transform of $f(x) = 1 - |x|$ if $|x| < 1$ and hence find the value of $\int_0^{\infty} \frac{\sin^4 t}{t^4} dt$

20 Using finite fourier transform, solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$

given u(0,t)=0 and u(4,t)=0

u(x,0)=2x where 0<x<4, t>0

Z-Z-Z END