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PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2024
(Second Semester)

Branch – **ELECTRONICS**

MATHEMATICS - II

Time: Three Hours — Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1 Which of the following is not the condition for Dirichlet of a function to be expanded as Fourier series.
(i) $f(x)$ is well-defined
(ii) $f(x)$ is finite or bounded.
(iii) $f(x)$ has infinite number of discontinuous points
(iv) $f(x)$ has only a finite number of maxima or minima.

2 The partial differential equation formed from z=(x+y)$f(x^2-y^2)$ is
(i) px+qy=z (ii) py+qx=z
(iii) py − qx=z (iv) px − qy=z

3 Laplace transform of $f(x)$ is $\frac{s}{s^2-4}$. Then $f(x)$ is
(i) $f(x)=\sin(2x)$ (ii) $f(x)=\cosh(2x)$
(iii) $f(x)=\sinh(2x)$ (iv) $f(x)=\cos(2x)$

4 If the vectors $2\hat{\imath}+\hat{\jmath}+\hat{k}$ and $\vec{\imath}-4\vec{\jmath}+\lambda\vec{k}$ are mutually perpendicular, then the value of λ is
(i) 1 (ii) 2 (iii) 3 (iv) 4

5 Surface integral is used to convert ______ into _______
(i) surface integral, volume integral (ii) line integral, volume integral
(iii) line integral, surface integral (iv) none of the above

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a Obtain the sine series for unity in $(0,\pi)$.
OR
b Express $f(x)$=c − x when 0<x<c as a half range cosine series with period 2c.

7 a Solve $x\frac{\partial z}{\partial x}=2x+y+3z$.
OR
b Solve $\frac{\partial^2 z}{\partial x^2}-4\frac{\partial z}{\partial x}+3z=e^{3x}$

8 a Define Laplace transform and find $L\left[\frac{1}{\sqrt{t}}\right]$.
OR
b Find the inverse Laplace transform of $\frac{s}{(s+3)^2+4}$.

9 a Find a unit vector normal to the surface $x^2+y^2-z=10$ at (1,1,1).
OR
b Find Curl $\vec{F}$ where $\vec{F}$=grad$(x^3+y^3+z^3-3xyz)$.

Cont...

10 a If $\vec{F}=(3x^2+6y)\vec{i}-14yz\vec{j}+20xz^2\vec{k}$, evaluate $\int \vec{F}.d\vec{r}$ from (0,0,0) to (1,1,1) along the curve x=t, y=t^2 and z=t^3.

OR

b If $ax\vec{i}+by\vec{j}+cz\vec{k}$ where a, b, c are constants, Show that $\int\int \vec{F}.\hat{n}ds=\frac{4\pi}{3}(a+b+c)$.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a If $f(x)=|\cos x|$,expand $f(x)$as a Fourier series in the interval $(-\pi,\pi)$.

OR

b Obtain the Fourier expansion of $x\sin x$as a cosine series in $(0,\pi)$.

12 a Find the particular integral of $(D^2+4DD'-5D'^2)z=\sin(2x+3y)$.

OR

b Find the complete solution of $\frac{\partial^2 z}{\partial x^2}-4\frac{\partial^2 z}{\partial x\partial y}+4\frac{\partial^2 z}{\partial y^2}=e^{2x+y}$.

13 a Evaluate $\int_0^\infty te^{-3t}\sin t dt$ using Laplace transform.

OR

b Find the inverse Laplace transform of $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$

14 a Prove $\vec{f}=(y^2\cos x+z^3)\vec{i}+(2y\sin x-4)\vec{j}+(3xz^2)\vec{k}$ is irrotational and find its scalar potential.

OR

b Show that $r^n\vec{r}$ is an irrotational vector for any value on n but is solenoidal only if n= − 3.

15 a Evaluate $\int\int \vec{F}.\hat{n}dS$ where $\vec{F}=z\vec{i}+x\vec{j}-y^2z\vec{k}$ and S is the surface of the cylinder $x^2+y^2=1$ included in the first octant between the planes z=0 and z=2.

OR

b Verify Stokes theorem for $\vec{F}=(x^2+y^2)\vec{i}-2xy\vec{j}$ taken around the rectangle bounded by the lines x= ± a,y=0,y=b.

Z-Z-Z END