18ELU06

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2022
(Second Semester)

Branch - **ELECTRONICS**

MATHEMATICS-II

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** marks **(5x 1 = 5)**

1. Which of the following is an even function?
   (i) $x^3 cosx$ (ii) sin^3x
   (ii) $|x|$ (iv) tan^3x
   (iii)

2. What is the Solution of $\frac{\partial z}{\partial y} = sinx$?
   (i) Cosx+f(y) (ii) -cosx+f(y)
   (iii) cosx+c (iv) cosx+f(x)

3. L(1)=_____
   (i) $\frac{1}{s}$ (ii) $\frac{1}{s^2}$
   (iii) s (iv) $\frac{1}{s^3}$

4. What is the gradient of a constant?
   (i) constant (ii) zero
   (iii) x (iv) ∇f

5. When the force field is said to be conservative?
   (i) $\nabla \cdot \vec{f}=0$ (ii) $\nabla x \vec{f}=0$
   (iii) $\nabla(\nabla f)=0$ (iv) $\nabla x \nabla \vec{f}=0$.

SECTION - B (15 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks **(5 x 3 = 15)**

6. (a)Calculate a_0 *and* a_n for f(x) $=\begin{cases} -k, & -\pi < x < 0 \\ k, & 0 < x < \pi \end{cases}$

   (OR)

   (b)Calculate half range sine series of f(x) $=x^2$ *in* $(0, \pi)$.

7. (a)Form the partial differential equation by eliminating the arbitrary constants from z=$(x^2$+a)($(y^2 + b)$.

   (OR)

   (b) Solve pq=1.

8. (a)Find L$(sinh6t + 3e^{-5t} + cos5t)$

   (OR)

   (b)Find L(t^2e^{-3t})

Cont...

9. (a) Show that $\vec{F} = (y^2 + 2xz^2)\vec{i} + (2xy - z)\vec{j} + ((2x^2z - y + 2z)\vec{k}$ is irrotational .

(OR)

(b) If $u = x^2 - y^2, prove\ that\ \nabla^2 u=0$.

10. (a) If $\vec{F}=x^2\vec{i}+y^2\vec{j}$,evaluate $\int \vec{F}.d\vec{r}$ along the line y=x from (0,0) to (1,1).

(OR)

(b) If $\vec{F}$= ax$\vec{i}$ +by$\vec{j}$+cz$\vec{k}$, a,b,c are constants show that $\iint_S \vec{F} \cdot \hat{n}\, dS$ $=\frac{4\pi}{3}$(a+b+c),where S is the surface of a unit sphere.

SECTION -C (30 Marks)

Answer **ALL** questions

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

11. (a) Calculate the fourier series for the function f(x)=e^x defined in $(-\pi, \pi)$

(OR)

(b) Expand $x(2\pi - x)$ as a Fourier series in $(0,2\pi)$.

12. (a) Solve $p^2 + q^2 = npq$.

(OR)

(b) Solve $z = px + qy + 2\sqrt{pq}$

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

(OR)

(b) Solve $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} - 5y = 5$ given that y=0,$\frac{dy}{dt} = 2$ when t=0.

14. (a) If $\vec{F}$=3xyz$^2\vec{i}$ +2xy$^3\vec{j}$ -$x^2yz\vec{k}$ and f =3x^2-yz find $\nabla \cdot (\nabla f)$ at the point (1,-1,1).

(OR)

(b) If $\vec{F} = xz^3\vec{i}$ -2x^2yz$\vec{j}$ +2yz$^4\vec{k}$ find curl $\vec{F}$ at (1,-1,1).

15. (a) Verify the Gauss divergence theorem for $\vec{F}$ =4xz$\vec{i}$ -$y^2\vec{j}$ +yz$\vec{k}$ over the cube bounded by x=0,x=1,y=0,y=1,z=0,z=1.

(OR)

(b) Verify Stoke's theorem for a vector field defined by $\vec{F} = (x^2 - y^2)\vec{i}$ +xy$\vec{j}$ in the rectangular region in the XOY plane bounded by the lines x=0, x=a, y=0 and y=b.

Z-Z-Z END