TOTAL PAGES : 2

22PHU103N / 22PHU103

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2024
(First Semester)

Branch- **PHYSICS**

MATHEMATICS – I FOR PHYSICS

Time: Three Hours | Maximum: **75** Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Curvature of a curve y = f(x) is defined as (a) $\frac{dy}{dx}$ (b) $\frac{dy}{ds}$ (c) $\frac{d\chi}{ds}$ (d) $\frac{ds}{d\chi}$	K1	CO1
	2	The radius of curvature of a curve y = f(x) is defined as ________ (a) $\frac{dx}{dy}$ (b) $\frac{ds}{dy}$ (c) $\frac{ds}{d\chi}$ (d) $\frac{d\chi}{ds}$	K2	CO1
2	3	$\int u\, dv$ = ___________ (a) uv - $\int$ vdu (b) uv + $\int$ v du (c) uv – vdu (d) None	K1	CO2
	4	$\int_a^b f(x)\,dx$ = _____________,where f(x) is an odd function. (a) $\int_a^b f(x)\,dx$ (b) $-\int_b^a f(x)\,dx$ (c) $\int_c^b f(x)\,dx$ (d) None	K2	CO2
3	5	The value of $\int_0^1\int_0^2 (x+2)\, dy\, dx$ is (a) 5 (b) 15 (c) 10 (d) 20	K1	CO3
	6	The value of $\int_0^1\int_0^1\int_0^1 dx\, dy\, dz$ is (a) 1 (b) 3 (c) 0 (d) 2	K2	CO3
4	7	$\nabla \times \vec{r}$ = _____________. (a) $\vec{r}$ (b) 3 (c) 0 (d) $2\vec{r}$	K1	CO4
	8	If $\vec{r} = x\bar{i} + y\bar{j} + z\bar{k}$, then div($\vec{r}$) = _______ (a) 0 (b) 3 (c) 5 (d) 2	K2	CO4
5	9	$\int_C \bar{F}.d\bar{r} = \iint_S (\nabla\times\bar{F}),\hat{n}\, ds$. Find whether the given statement is (a) Green's theorem (b) Stoke's theorem (c) Surface theorem (d) Gauss divergence theorem.	K1	CO5
	10	$\iint_S \bar{F}.\, ds = \iiint_V \nabla.\bar{F}dv$. Find whether the given statement is (a) Green's theorem (b) Stoke's theorem (c) Surface theorem (d) Gauss divergence theorem.	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Obtain the radius of curvature at the point $\left(\frac{a}{4},\frac{a}{4}\right)$ to the curve $\sqrt{x}+\sqrt{y}=\sqrt{a}$.	K2	CO1
		(OR)		
	11.b.	Show that the radius of curvature at the point 'θ' on the curve x = a (cosθ + θsinθ), y = a (sinθ - θcosθ).		
2	12.a.	Find $\int e^{ax}x^3dx$, using Bernoulli's formula.	K2	CO2
		(OR)		
	12.b.	Evaluate $\int x\, e^x dx$, by integration by parts.		
3	13.a.	Find $\int_0^1\int_0^2 (x^2+y^2)$ dy dx.	K3	CO3
		(OR)		
	13.b.	Find $\int_2^4\int_0^x\int_0^{\sqrt{x+y}}$ z dz dy dx.		
4	14.a.	Find grad ϕ if ϕ = xyz at (1, 1, 1).	K3	CO4
		(OR)		
	14.b.	Find the directional derivative of ϕ = xy + yz + zx in the direction of the vector $\bar{i}+2\bar{j}+2\bar{k}$ at (1, 2, 0).		
5	15.a.	If $\bar{F}=x^2\bar{i}+xy\bar{j}$, evaluate $\int \bar{F}.d\bar{r}$ from (0, 0) to (1, 1) along the line y = x..	K3	CO5
		(OR)		
	15.b.	Evaluate $\int_C \bar{F}.d\bar{r}$, by stoke's theorem where $\bar{F}=(x^2-y^2)\bar{i}+xy\bar{j}$ in the rectangular region in the xoy plane bounded by the lines x = 0, x =a, y = 0 and y = b.		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Prove that the radius of curvature at the point x = 3a cosθ - a cos3θ, y = 3a sinθ - a sin 3θ is 3a sinθ	K2	CO1
2	17	Evaluate $\int_0^{\pi/4}$ log (1 + tanϕ) dϕ.	K2	CO2
3	18	Find the area bounded by a quadrant of the ellipse $4x^2 + 9y^2 = 36$.	K3	CO3
4	19	If $\bar{F}=x^2\bar{i}+y^2\bar{j}+z^2\bar{k}$, then find ∇. $\bar{F}$ and ∇x $\bar{F}$	K3	CO4
5	20	Verify the Gauss divergence theorem for $\bar{F}=4xz\bar{i}-y^2\bar{j}+yz\bar{k}$ over the cube bounded by x = 0, x =1, y = 0, y =1, z = 0, z = 1	K3	CO5

Z-Z-Z END