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SUBJECT CODE NO: - YY-2350
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. F.Y (Sem- II)
Examination March / April - 2023
Mathematics Paper -IV Integral Calculus

[Time: 1:30 Hours]

[Max. Marks: 40]

Please check whether you have got the right question paper.

N. B

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

- Q1 A. Attempt any one. 05
- a) Obtain a reduction formula for $\int \cos^n x \, dx$, where n is any integer.
 - b) Evaluate : $\int \frac{1}{x^2-x-6} \, dx$.
- B. Attempt any one. 05
- c) Evaluate : $\int \frac{dx}{\sin^3 x \cos^5 x}$
 - d) Evaluate : $\int \frac{dx}{\sin x - \sin^3 x}$
- Q2 A. Attempt any one. 05
- a) Evaluate $\int_a^b x^2 \, dx$ as the limit of a sum.
 - b) Show that the intrinsic equation of the semi-cubical parabola $3ay^2 = 2x^3$ is $S = \frac{4}{9} a(\sec^3 \psi - 1)$
- B. Attempt any one. 05
- c) Find the whole length of the curve $x^{2/3} + y^{2/3} = a^{2/3}$
 - d) The part of the parabola $y^2 = 4ax$ cut by the latus rectum revolves about the tangent of the Vertex. Find the volume of the reel thus generated.
- Q3 A. Attempt any one. 05
- a) Prove that, the field \vec{F} is conservative over a region if and only if $\oint \vec{F} \cdot d\vec{r} = 0$ along any closed curve in the region.
 - b) Prove that $\int_S \vec{r} \cdot \vec{n} \, ds = 3V$, where S is closed surface, and V is volume enclosed.

B. Attempt any one:

05

c) Evaluate $\int_C \vec{F} \cdot d\vec{r}$, where $\vec{F} = x^2y^2 \hat{i} + y\hat{j}$, and the curve C is $y^2 = 4x$ in the xy-plane from (0,0) to (4,4)

d) Evaluate $\int_C \vec{F} \cdot d\vec{r}$ by stoke's theorem where $\vec{F} = y^2\hat{i} + x^2\hat{j} - (x+z)\hat{k}$ and c is the boundry of the friangle whose vertices are (0,0,0) , (1,0,0) and (1,1,0)

Q4 Choose the correct alternative and rewrite the sentence.

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1) The value of $\int_0^{\pi/2} \sin^3 x dx = \dots\dots\dots$

- a) $\frac{3}{2}$ b) $\frac{1}{3}$ c) $\frac{2}{3}$ d) $\frac{5}{3}$

2) Rectification is the process of determining

- a) The area under curve
b) The arc length of plane curve
c) Double integral
d) Multiple integral

3) $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$ is an equation of

- a) Cycloid
b) Cardioid
c) Astroid
d) None of these

4) The volume of the solid generated by the revolution about the x-axis, of the area bounded by the curve $y=f(x)$, the ordinates at $x=a$, $x=b$, and the x-axis, is

- a) $\int_a^b x^2 dx$ b) $\pi \int_a^b x^2 dy$ c) $\int_a^b y dx$ d) $\pi \int_a^b y^2 dx$

5) If the circulation of a vector point function \vec{F} along any closed curve in a region is zero, then \vec{F} is said to be

- a) Irrational b) Rotational c) Solenoidal d) None of these