**B-2161**

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**SUBJECT CODE NO:- B-2161**
**FACULTY OF SCIENCE AND TECHNOLOGY**
**B.Sc. F.Y (Sem.-II) Examination OCT/NOV 2019**
**Mathematics MAT - 201**
**(Integral Calculas)**

**[Time: 1:30 Hours]** **[Max.Marks:50]**

Please check whether you have got the right question paper.

**N.B**
1) Attempt all questions.
2) Figures to the right indicate full marks.

**Q.1** **A)** Attempt any one: **08**

a) Obtain a reduction formula for $\int x^n e^{ax} dx$ and apply it to evaluate $\int x^3 e^{ax} dx$.

b) Obtain a reduction formula for $\int \cos^n x\, dx$ , where n is positive integer. Hence evaluate $\int \cos^4 x\, dx$ .

**B)** Attempt any one: **07**

c) Evaluate $\int \frac{2x-3}{(x^2-1)(2x+3)}\, dx$

d) Evaluate $\int \frac{(x^2+x+1)}{(x+1)^2(x+2)}\, dx$

**Q.2** **A)** Attempt any one **08**

a) Evaluate $\int_a^b \sin x\, dx$ as the limit of a sum.

b) Find the area enclosed between one arch of the cycloid $x = a(\theta - \sin\theta), y = a(1 - \cos\theta)$ and its base.

**B)** Attempt any one **07**

c) Find the length of the arc of the curve $y = \log\sec x$ from x=0 to x=$\pi/3$ .

d) Find the volume of the solid obtained by revolving the cardioide $r = a(1 + cos\theta)$ about the initial line.

**Q.3** A) Attempt any one **05**

a) Show that the volume obtained by revolving about X-axis, the arc of the curve $y = f(x)$, intercepted between the points whose abscissae are a,b is $\int_a^b \pi y^2 dx$, it being assumed that the arc does not cut X-axis.

b) Prove that the necessary and sufficient condition for a continuous vector point function to be irrotational in a simply connected region R is that it is the gradient of a scalar point function.

B) Attempt any one: **05**

c) Evaluate $\int_C \vec{F}.d\vec{r}$ when

$$\vec{F} = xy\vec{\imath} + yz\vec{\jmath} + zx\vec{k}$$

Where C is the curve
$r = \vec{\imath}t + \vec{\jmath}t^2 + \vec{k}t^3$ ; t varying from -1 to +1.

d) If $\overrightarrow{OA} = a\vec{\imath}$ , $\overrightarrow{OB} = a\vec{\jmath}$ , $\overrightarrow{OC} = a\vec{k}$ form three coterminous edges of a cube and S denotes the surface of the cube,
Evaluate $\int_S \{(x^3 - yz)\vec{\imath} - 2x^2y\vec{\jmath} + 2\vec{k}\}$. nds

**Q.4** Choose the correct alternative and fill in the blanks. **10**

1) $\int \frac{dx}{(3-2x)^4} = -----$
$a) -\frac{1}{6}\cdot\frac{1}{(3-2x)^3}$ b) $\frac{1}{6}\cdot\frac{1}{(3-2x)^3}$ c) $\frac{1}{(3-2x)^3}$ d) $\frac{1}{6(3-2x)^5}$

2) $\int \cos^3 x\, dx = ------$
a) $-\sin x + \frac{\sin^3 x}{3}$ b) $-\sin x - \frac{\sin^3 x}{3}$
c) $\sin x - \frac{\sin^3 x}{3}$ d) $\sin x + \frac{\sin^3 x}{3}$

3) A curve $\vec{r} = \vec{f}(t)$ , is called smooth if $\vec{f}(t)$ , is ------------.
a) Differentiable
b) Continuously differentiable
c) Discontinuous
d) None of these

4) The process of determining the area of a plane region is known as ---------.
a) Quadrature b) Rectification c) Volume d) none of these

5) $\int_S \vec{r}.d\vec{a} = -----$where V is the volume enclosed by the surface S.
a) V b) 3V c) $\frac{1}{3}V$ d) 2V