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6608

Your Roll No.....

B.Sc. (Hons.) / Computer Science / II Sem. B

Paper 203 – Calculus II

(Admissions of 2001 and onwards)

Time : 3 Hours

Maximum Marks : 75

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

All questions are compulsory.

All questions carry equal marks.

1. Use area to evaluate the integral

$$\int_{-1}^1 (3 - 2|x|) dx .$$

2. Use Fundamental Theorem of Calculus to evaluate dy/dx where

$$y = \int_0^{x^2} (\cos(\sqrt{t})) dt .$$

3. Find the volume of the solid that lies between planes perpendicular to the X-axis at $X = 0$ and $X = 4$. The cross sections perpendicular to the axis on the interval $0 \leq X \leq 4$ are isocles right triangles with hypotenuse running from the parabola $y = -\sqrt{x}$ to the parabola $y = \sqrt{x}$.

P.T.O.

4. The region in the first quadrant bounded by the curve $x = y - y^3$ and the y-axis is revolved about X-axis. Find the volume of the solid so obtained.
5. Find the surface area of the volume of the solid obtained by revolving the curve $y = \sqrt{x+1}$ $1 \leq X \leq 5$ about X-axis.
6. If acceleration of a particle at time t is given by
- $$\vec{a}(t) = -3\cos t \hat{i} - 3\sin t \hat{j} + 2\hat{k}$$
- Its initial position and velocity are
- $$\vec{r}(0) = 3\hat{i} \quad \text{and} \quad \vec{v}(0) = 3\hat{j},$$
- Find the position $\vec{r}(t)$ of the particle at any time t.
7. Find the average value of the function
- $$f(x, y) = xy(x + y)$$
- over the region R bounded by $x^2 = y$ and $y = x$.
8. Find the volume of the cylinder whose base lies in the region that lies inside the cardioid $r = 1 + \cos\theta$ and outside the circle $r = 1$. The top of the cylinder lies in the plane $Z = X$.
9. Evaluate the integral

$$\int_0^4 \int_0^1 \int_{2y}^2 \frac{4(\cos x^2)}{2\sqrt{z}} dx dy dz$$

- by changing the order of integration in an appropriate way.
10. Write $f(x) = \cos x$, $0 \leq x \leq \pi$ in terms of series of sines of multiples of x.
11. State Cauchy-Riemann Equations for an analytic function. Show that $f(z) = \bar{z}$ is not analytic.
12. Find principal values and any two other values of each of the following :
- $\log(-i)$; i^i
13. State Cauchy Integral Formula, and hence evaluate $\oint_C \frac{dz}{z^3 - 1}$, where C is the circle $|z - 1| = 1$ described in counter-clockwise direction.
14. Obtain Laurent Series Expansion of $f(z) = \frac{1}{z^2 + 1}$ at the centre $a = i$.
15. Use Calculus of residues to evaluate

$$\int_{-\infty}^{\infty} \frac{dx}{x^4 + 16}$$