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Roll No.

Total No. of Pages : 03

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B.Tech. (2007-2010 Batches) (Sem.–1) ENGINEERING MATHEMATICS-I Subject Code : AM-101 Paper ID : [A0111]

Time : 3 Hrs.

Max. Marks: 60

INSTRUCTION TO CANDIDATES :

- 1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION B & C. have FOUR questions each.
- 3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
- 4. Select atleast TWO questions from SECTION B & C.

SECTION-A

- 1. Write briefly :
 - (i) Sketch the graph of y = |x| + 2x.
 - (ii) Find the area of the region enclosed by the parabola $y = 2 x^2$ and the line y = -x.

(iii) If
$$u = \sin\left(\frac{x}{y}\right)$$
, $x = e^t$, $y = t^2$, find $\frac{du}{dt}$

- (iv) Find the percentage error in the area, of an ellipse when an error of +1 percent is made in measuring the major and minor axes.
- (v) Find the equation of the sphere whose center is (2, -3, 4) and radius 5.
- (vi) Find the equation of the quadratic cylinder whose generators intersect the curve $ax^2 + by^2 = 2z$, lx + my + nz = p and are parallel to z-axis.

(vii) Evaluate
$$\int_{0}^{\frac{\pi}{2}} \left[\int_{0}^{a\cos\theta} r\sqrt{a^2 - r^2} \, dr \right] d\theta$$

[MCode - 54001]

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(viii) Calculate
$$\iint_R f(x, y) dA$$
 for $f(x, y) = 1 - 6x^2 y$ and $R: 0 \le x \le 2, -1 \le y \le 1$.

(ix) Discuss the convergence or divergence of the series $\sum \frac{\sec^{-1} n}{n^{1.3}}$.

(x) If
$$\sin (A + iB) = x + iy$$
, prove that $\frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} = 1$

SECTION - B

- 2. Graph the functions (a) $y = x^{\frac{5}{3}} 5x^{\frac{2}{3}}$ (b) $y = |x^2 1|$.
- 3. The region bounded by the curve $y = x^2 + 1$ and the line y = -x + 3 is revolved about the x-axis to generate a solid. Find the volume of the solid.

4. (i) If
$$z = xf\left(\frac{y}{x}\right) + g\left(\frac{y}{x}\right)$$
, show that $x^2 \frac{\partial^2 z}{\partial x^2} + 2xy \frac{\partial^2 z}{\partial x \partial y} + y^2 \frac{\partial^2 z}{\partial y^2} = 0$.

(ii) Verify Euler's theorem for the function, $u = \left(x^{\frac{1}{2}} + y^{\frac{1}{2}}\right) \left(x^n + y^n\right)$.

5. Find the minimum value of $x^2 + y^2 + z^2$, given that ax + by + cz = p.

SECTION-C

6. Find the equation of the sphere which passes through the points (1, -4, 3), (1, -5, 2), (1, -3, 0) and whose center lies on the plane, x + y + z = 0.

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7. Change the order of integration in the following integral and evaluate



8. Find the radius and interval of convergence for the following power series



For what values of x, does the series converges (a) absolutely, (b) conditionally

9. If
$$C = \cos^2 \theta - \frac{1}{3}\cos^3 \theta \cos 3\theta + \frac{1}{5}\cos^5 \theta \cos 5\theta - ...$$
, then prove that $\tan 2C = 2 \cot^2 \theta$.

 $\mathbf{1}$