C 56041

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Name

Reg. No.....................

FIRST/SECOND SEMESTER B.Sc. DEGREE EXAMINATION
MARCH/APRIL 2009

Mathematics (Subsidiary)

Paper I---ANALYTICAL GEOMETRY AND CALCULUS

(2001 admission onwards)

Maximum : 65 Marks

me : Three Hours

Maximum marks that can be scored from Unit I is 20 ; *Unit II is* 30 ; *and Unit III is* 15.

Unit I (Analytic Geometry)

(Maximum Marks : 20)

(6 marks)

1. Change $x^2 + y^2 + z^2 + 6xy = 1$ into spherical polar co-ordinates.

If the normal at the point $\left(at_1^2, 2at_1\right)$ on the parabola $y^2 = 4ax$ meets again at $, 2at_2\right)$ on the curve. Show that $t_2 = -\frac{2}{t_1}$

(6 marks)

(8 marks)

3. Find the centre, foci and directrices of the ellipse $4x^2 + 9y^2 - 48x + 72y + 144 = 0$.

4. Transform the equation $4x^2 + 2\sqrt{3x}\ y + 2y^2 = 1$ by rotating the axis through an angle 30° through the origin.

(6 marks)

5. Find the centre and radius of the sphere :

$x^2 + y^2 + z^2 + 4x + 3y + 3z + 2\ 0$.

(4 marks)

Unit II (Differential Calculus)

(Maximum Marks : 30)

6. Find the derivatives of

(2 marks).

(a) $y = \log_„ (\cosh x)$.

(2 marks)

(b) $y = \sec h^{-} \frac{x}{a}$,

Turn over

7. If $y = a\cos(\log x) + b\sin(\log x)$, prove that

$$+ (2n+1)\, xy_{n+1} + (n^2+1) \quad = 0.$$

(5 marks)

8. Verify Rolle's theorem for the function $(x) = x^{\frown} + x + 4$ in the interval 2] and find the number c such that $f(c) = 0$.

9. Show that

(5 ms

$$\tan\left(\frac{\pi}{4} + x\right) = 1 + 2x + 2x2 \quad 3 \quad + \frac{10}{3}x + \ldots.$$

using Maclurin's series.

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10. For the curve $y(a +$ ax, prove that $\left(\frac{2\rho}{a}\right. = \left(\frac{y}{x}\right)^2 \quad x^2$, where p is the radius of curvature.

(5 marks'

11. Find all asymptotes to the curve $y^3 + x^{-} y + 2xy^{-} y + 1 = 0$.

(6 marks)

12. If $u\ f(y-z, z-x, x-y)$, prove that $\frac{au}{\partial x} \frac{au}{\partial y} \frac{au}{\partial z}$ 0.

(3 marks)

13. Verify Euler theorem for : $x^3 \log\left(\frac{y}{x}\right.$.

(4 marks)

14. Given $u = \sin(x^2 + v^2)$, where $x = 3t$ and $Y \frac{1}{1+t^2}$ determine $\frac{du}{dt}$. (5 marks)

Unit III (Integral Calculus)

(Maximum Marks : 15)

15. Use trapezoidal rule to evaluate $\int_0 x^3\, dx$ considering five sub intervals.

(5 marks)

16. Find the area bounded by one loop of the curve r a sin 30.

17. Find the volume generated by revolving one arch of the cycloid $x \quad a(0 + \sin\theta)$, $y = a(1 +$ cos 0) about the x-axis. (5 marks)

18. Find the surface area of a sphere of radius a. (5 marks)

(5 marks)

19. Change the order of integration and hence evaluate $f_0^{\sim} \int_x^{\circ} \frac{e^{-y}}{y}\, dy\, dx$.

(5 marks)