

MATHEMATICS PAPER IIB - MAY 2008
COORDINATE GEOMETRY & CALCULUS

TIME: 3hrs

Max. Marks.75

Note: This question paper consists of three sections A, B and C.

SECTION A

Very Short Answer Type Questions.

10X2 =20

Note : Attempt all questions. Each question carries 2 marks.

1. Find the equation of the circle passing through (2,-1) and having the center at (2, 3)
2. Find the centre and radius of the sphere $x^2 + y^2 + z^2 - 2x - 4y - 6z = 11$.
3. If (1,2) and (k,-1) are conjugate points w.r.t to the parabola $y^2=8x$, then find k.
4. If the eccentricity of a hyperbola be $5/4$, then find the eccentricity of its conjugate hyperbola.
5. Find the n^{th} derivative of $\log(4X^2 -9)$
6. Evaluate $\int e^x \left(\frac{1+x \log x}{x} \right) dx$ on $(0, \infty)$
7. Evaluate $\int \frac{2x^2}{1+x^8} dx$
8. Evaluate $\int_0^4 |2-x| dx$
9. Find the area of the region enclosed by the given curves $y = x^3 + 3, y = 0, x = -1$ and $y = 2x$
10. Form the differential equations of the following family of curves where parameters are given in brackets $y = ae^{3x} + be^{4x}; (a,b)$

SECTION B

Short Answer Type Questions.

5X4 =20

Note: Answer any FIVE questions. Each question carries 4 marks.

11. Find the equation of tangent and normal at (3,2) of the circle $x^2 + y^2 - x - y - 4 = 0$
12. If the focal chord of the parabola $y^2 = 4ax$ meets it at P,Q and if S the focus then
Prove that $\frac{1}{SP} + \frac{1}{SQ} = \frac{1}{a}$.
13. Find the equation of tangent to the ellipse $2x^2 + y^2 = 8$ which is parallel and perpendicular to $x - 2y - 4 = 0$
14. Show that the following points form an equilateral triangle $(0,0), \left(5, \frac{\pi}{18}\right)$ and $\left(5, \frac{7\pi}{18}\right)$.
15. Evaluate $\int \frac{1}{\sqrt{2x - 3x^2 + 1}} dx$
16. Solve $\frac{dy}{dx} + \frac{y^2 + y + 1}{x^2 + x + 1} = 0$

17. Solve $\frac{dy}{dx} + \frac{y^2 + y + 1}{x^2 + x + 1} = 0$

SECTION C

Long Answer Type Questions.

5X7 =35

Note: Answer any Five of the following. Each question carries 7 marks.

18. Find the equations of transverse common tangents of $x^2 + y^2 - 4x - 10y + 28 = 0$;
 $x^2 + y^2 + 4x - 6y + 4 = 0$.
19. Find the equation of the circle which is orthogonal to each of the following circles
 $x^2 + y^2 + 2x + 17y + 4 = 0, x^2 + y^2 + 7x + 6y + 11 = 0, x^2 + y^2 - x + 22y + 3 = 0$.
20. Derive the equation of the hyperbola in standard form.
21. If $y = \sin^{-1}x$ then show that $(1-x^2)y'' - xy' = 0$, Hence show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2y_n = 0$
22. Evaluate $\int \frac{2 \cos x + 3 \sin x}{4 \cos x + 5 \sin x} dx$
23. Evaluate $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$
24. Evaluate $\int_1^5 \frac{dx}{1+x}$ approximately by using the Simpson's rule with $n=4$
