MODEL PAPER 1

PART-III

MATHEMATICS

PAPER-II(B)

Time : 3 Hours | Max. Marks : 75

SECTION - A (10 × 2 = 20)

Note : (i) Answer **all** questions.

(ii) Each question carries **two** marks.

(iii) All are **Very Short Answer Type Questions.**

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1. Find the equation of the circle, which is concentric with $x^2 + y^2 - 6x - 4y - 12 = 0$ and passing through (– 2, 14).
2. Find the equation of the normal at P(3, 5) of the circle $S = x^2 + y^2 - 10x - 2y + 6$.
3. If the angle between the circles $x^2 + y^2 - 12x - 6y + 41 = 0$ and $x^2 + y^2 + kx + 6y - 59 = 0$ is 45°, find k.
4. Find the co-ordinates of the points on the parabola $y^2 = 8x$ whose focal distance is 10.
5. If $3x - 4y + k = 0$ is a tangent to the hyperbola $x^2 - 4y^2 = 5$ find the value of k.
6. Evaluate : $\int e^x \cos x \, dx$ on R.
7. Find : $\int \frac{\sin(\tan^{-1} x)}{1 + x^2} dx$, $x \in R$
8. Evaluate : $\int_0^4 |2 - x| \, dx$.
9. Find the area bounded between the curves $y^2 - 1 - 2x$ and $x = 0$.
10. Form the differential equation corresponding to $y = cx - 2c^2$, where 'c' is a parameter.

SECTION - B (5 × 4 = 20)

Note : Short answer type questions.

(i) Attempt any **five** questions.

(ii) Each question carries **four** marks.

- - -

11. If the abscissae of points A, B are the roots of the equation $x^2 + 2ax - b^2 = 0$ and ordinates of A, B are roots of $y^2 + 2py - q^2 = 0$, then find the equation of a circle for which $\overline{AB}$ is a diameter.
12. Find the radical centre of the circles $x^2 + y^2 - 4x - 6y + 5 = 0$, $x^2 + y^2 - 2x - 4y - 1 = 0$ and $x^2 + y^2 - 6x - 2y = 0$.
13. Find the equation of the ellipse referred to its major and minor axes as the coordinate axes X, Y respectively with latus rectum of length 4, and distance between foci $4\sqrt{2}$.

14. Find the eccentricity, coordinates of foci, length of latus rectum and the equations of directrices of the ellipse $9x^2 + 16y^2 - 36x + 32y - 92 = 0$.

15. Prove that the point of intersection of two perpendicular tangents to the hyperbola $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ lies on the circle $x^2 + y^2 = a^2 - b^2$.

16. Evaluate $\int_{-a}^{a} x^2(a^2 - x^2)^{3/2}\,dx$.

17. Solve the following differential equation $(x + y + 1)\frac{dy}{dx} = 1$.

SECTION - C $(5 \times 7 = 35)$

Note : Long answer type questions.

(i) Attempt any **five** questions.

(ii) Each question carries **seven** marks.

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18. Find the equation of a circle which passes through (4, 1), (6, 5) and having the centre on : $4x + 3y - 24 = 0$.

19. Show that the circles :

$x^2 + y^2 - 6x - 9y + 13 = 0$,

$x^2 + y^2 - 2x - 16y = 0$

touch each other. Find the point of contact and the equation of common tangent at their point of contact.

20. Find the equation of the parabola whose axis is parallel to x – axis and which passes through the points (–2, 1), (1, 2) and (– 1, 3).

21. Evaluate : $\int \frac{2\cos x + 3\sin x}{4\cos x + 5\sin x}dx$.

22. Obtain reduction formula for $I_n = \int \tan^n x\,dx$, n being a positive integer $n \geq 2$ and deduce the value of $\int \tan^6 x\,dx$.

23. Show that :

$$\int_0^{\frac{\pi}{2}} \frac{x}{\sin x + \cos x}dx = \frac{\pi}{2\sqrt{2}}\log\left(\sqrt{2}+1\right).$$

24. Solve the differential equation: $(x^2 - y^2)\,dx - xy\,dy = 0$.

PART-III

MATHEMATICS

PAPER-II(B)

MODEL PAPER 2

Time : 3 Hours | Max. Marks : 75

SECTION - A (10 × 2 = 20)

Note : (i) Answer **all** questions.

(ii) Each question carries **two** marks.

(iii) All are **Very Short Answer Type Questions.**

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1. Obtain the parametric equations of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$.
2. If the length of a tangent from (5, 4) to the circle $x^2 + y^2 + 2ky = 0$ is '1', then find 'k'.
3. Find the equation of the radical axis of the circles $x^2 + y^2 - 3x - 4y + 5 = 0$ and $3(x^2 + y^2) - 7x + 8y - 11 = 0$.
4. Find the value of k, if the line $2y = 5x + k$ is a tangent to the parabola $y^2 = 6x$.
5. If $3x - 4y + k = 0$ is a tangent to $x^2 - 4y^2 = 5$, find the value of k.
6. Evaluate $\int \cos\sqrt{x}\, dx$ on IR.
7. Evaluate $\int \frac{e^x(1+x)}{\cos^2(xe^x)} dx$ on $I \subset R \setminus \{x \in R : \cos(xe^x) = 0\}$
8. Find the value of $\int_0^{2\pi} \sin^4 x . \cos^6 x\, dx$.
9. Find $\int_0^{\pi/2} \sin^7 x\, dx$.
10. Find the general solution of $x + y \frac{dy}{dx} = 0$.

SECTION - B (5 × 4 = 20)

Note : (i) Answer any **five** question

(ii) Each question carries **four** marks.

(ii) All are **Short Answer Type Question**

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11. Find the value of k, if $kx + 3y - 1 = 0$, $2x + y + 5 = 0$ are conjugate lines with respect to the circle $x^2 + y^2 - 2x - 4y - 4 = 0$.
12. Find the equation and length of the common chord of the two circles :

    $x^2 + y^2 + 3x + 5y + 4 = 0$ and

    $x^2 + y^2 + 5x + 3y + 4 = 0$.

13. Find the equation of ellipse in the standard form, if it passes through the points (– 2, 2) and (3, –1).

14. Find the equations of tangent and normal to the ellipse $2x^2 + 3y^2 = 11$ at the point whose ordinate is 1.

15. Find the equation of the tangents to the hyperbola $x^2 - 4y^2 = 4$ which are :
    (i) Parallel
    (ii) Perpendicular to the line $x + 2y = 0$

16. Find the area enclosed by the curves $y = x^2 + 1$, $y = 2x - 2$, $x = -1$, $x = 2$.

17. Solve the differential equation $(1 + x^2)\frac{dy}{dx} + y = \tan^{-1} x$.

SECTION - C $(5 \times 7 = 35)$

Note : (i) Answer any **five** question

(ii) Each question carries **Seven** marks.

(ii) All are **Long Answer Type Questions**

- - -

18. Find the equation of circle passing through each of the three points (3, 4), (3, 2) and (1, 4).

19. Find the equation of a circle which passes through (4, 1), (6, 5) and having the centre on : $4x + 3y - 24 = 0$.

20. Derive the equation of a parabola in the standard form $y^2 = 4ax$ with diagram.

21. Evaluate $\int \frac{9\cos x - \sin x}{4\sin x + 5\cos x} dx$.

22. If $I_n = \int \cos^n x \, dx$, then show that $I_n = \frac{1}{n}\cos^{n-1} x \sin x + I_{n-2}$ and for $n \geq 2$ deduce the value of $\int \cos^4 x \, dx$.

23. Evaluate $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$.

24. Solve the differential equation

$$\frac{dy}{dx} = \frac{3y - 7x + 7}{3x - 7y - 3}.$$

PART-III

MATHEAMTICS

MODEL PAPER 3

PAPER-II(B)

Time : 3 Hours

Max. Marks : 75

SECTION - A $(10 \times 2 = 20)$

Note : (i) Answer **all** questions.

(ii) Each question carries **two** marks.

(iii) All are **Very Short Answer Type Questions.**

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1. Obtain the parametric equation of the circle represented by $x^2 + y^2 = 4$.
2. Find the equation of the circle, whose extremities of a diameter are $(-4, 3)$ and $(3, -4)$.
3. Show that the angle between the circles $x^2 + y^2 = a^2$, $x^2 + y^2 = ax + ay$ is $\frac{3\pi}{4}$.
4. Find the equation of the parabola whose vertex is $(3, -2)$ and focus is $(3, 1)$.
5. If the eccentricity of hyperbola is $\frac{5}{4}$, then find the eccentricity of its conjugate hyperbola.
6. Evaluate $\int \left(x + \frac{4}{1+x^2} \right) dx$ on IR.
7. Evaluate $\int (\tan x + \log \sec x)\, e^x\, dx$.
8. Evaluate $\int_1^5 \frac{dx}{\sqrt{2x-1}}$.
9. Evaluate $\int_0^3 \frac{x}{\sqrt{x^2+16}} dx$.
10. Find the general solution of $\frac{dy}{dx} = e^{x+y}$.

SECTION - B $(5 \times 4 = 20)$

Note : (i) Answer any **five** Questions.

(ii) Each question carries **four** marks.

(iii) All are **Short Answer Type Question**

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11. Find the length of the chord intercepted by the circle $x^2 + y^2 - x + 3y - 22 = 0$ on the line $y = x - 3$.
12. If $x + y = 3$ is the equation of the chord AB of the circle $x^2 + y^2 - 2x + 4y - 8 = 0$. Find the equation of the circle having AB as diameter.
13. Find the equation of the tangents to the ellipse $2x^2 + y^2 = 8$ which are (i) Parallel to $x - 2y - 4 = 0$ and (ii) Perpendicular to $x + y + 2 = 0$.

14. Show that the locus of the feet of the perpendiculars drawn from foci to any tangent of the ellipse is the auxiliary circle.

15. Find the equation to the hyperbola whose foci are (4,2) and (8,2) and eccentricity is 2.

16. Evaluate : $\int_0^{\pi/2} \frac{\cos^{5/2}x}{\sin^{5/2}x + \cos^{5/2}x}\,dx$.

17. Solve the differential equation :

$(xy^2 + x)\,dx + (yx^2 + y)\,dy = 0$

SECTION - C $(5 \times 7 = 35)$

Note : (i) Answer any five questions.

(i) Each question carries **seven** marks.

(iii) All are **Long Answer Type Question**

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18. Find the direct common tangents of the circles $x^2 + y^2 + 22x - 4y - 100 = 0$ and $x^2 + y^2 - 22x + 4y + 100 = 0$.

19. Show that the circle $x^2 + y^2 - 6x - 2y + 1 = 0$, $x^2 + y^2 + 2x - 8y + 13 = 0$ touch each other. Find the point of contact and the equation of common tangents to the circle.

20. Show that the equation of common tangents to the circle $x^2 + y^2 = a^2$ and the parabola $y^2 = 8ax$ are $y = \pm (x + 2a)$.

21. Evaluate $\int (6x+5)\sqrt{6 - 2x^2 + x}\,dx$.

22. Obtain the reduction formula for $I_n = \int \sin^n x\,dx$, n being a positive integer, $n \geq 2$ and deduce the value of $\int \sin^4 x\,dx$

23. Evaluate $\int_0^{\pi} \left(\frac{x \sin^3 x}{1 + \cos^2 x}\right) dx$

24. Solve : $(1 + y^2)\,dx = (\tan^{-1} y - x)dy$.

GUESS PAPER 1

PART-III

MATHEMATICS

PAPER-II(B)

Time : 3 Hours | Max. Marks : 75

SECTION - A (10 × 2 = 20)

Note : (i) Answer **all** questions.

(ii) Each question carries **two** marks.

(iii) All are **Very Short Answer Type Questions.**

- - -

1. Find the equation of the circle passing through (2,–1) and having the centre at (2 , 3).
2. Find the equations of the circles for which the points given below are the end points of a diameter,

   (1, 2) , (4,6).
3. Find the angle between the circles

   $x^2 + y^2 + 4x - 14y + 28 = 0$ and $x^2 + y^2 + 4x - 5 = 0$.
4. Find the vertex and focus of $x^2 - 6x - 6y + 6 = 0$.
5. Find the product of lengths of the perpendiculars from any point on the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ to its asymptotes.
6. Evaluate $\int e^x(\tan^{-1}x + \frac{1}{1+x^2})\,dx$, $x \in R$.
7. Evaluate : $\int \frac{e^x dx}{e^x + 1}$.
8. Evaluate : $\int_0^2 |1-x|\,dx$.
9. Evaluate: $\int_0^{\frac{\pi}{2}} \sin^4 x \cos^4 x dx$.
10. Find the general solution of $x + y\frac{dy}{dx} = 0$.

SECTION - B (5 × 4 = 20)

Note : Short answer type questions.

(i) Attempt any **five** questions.

(ii) Each question carries **four** marks.

- - -

11. Find the equation of the normal at P of the circle S = 0 where P and S are given by,

    P = (3,–4), $S \equiv x^2 + y^2 + x + y - 24$.
12. Show that the angle between the circles $x^2 + y^2 = a^2$, $x^2 + y^2 = ax + ay$ is $\frac{3\pi}{4}$

13. Find the equation of the ellipse in the standard form whose distance between foci is 2 and the length of latus rectum is $\frac{15}{2}$.

14. Find the equation of tangent and normal to the ellipse $x^2 + 2y^2 - 4x + 12y + 14 = 0$ at (2,–1).

15. If the lines $3x - 4y = 12$ and $3x + 4y = 12$ meets on a hyperbola $S = 0$, then find the eccentricity of the hyperbola $S = 0$.

16. Evaluate: $\int_0^{\pi/2} \sin 10x \, dx$

17. Solve $(1+x^2)\frac{dy}{dx} + y = \text{Tan}^{-1}x$.

SECTION - C $(5 \times 7 = 35)$

Note : Long answer type questions.

(i) Attempt any **five** questions.

(ii) Each question carries **seven** marks.

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18. Find the chord of contact of (1, 1) to the circle $x^2 + y^2 = 9$.

19. Find the number of possible common tangents that exist for the following pairs of circles.

$x^2 + y^2 + 6x + 6y + 14 = 0$

$x^2 + y^2 - 2x - 4y - 4 = 0$

20. Find the equations of axis and directrix of the parabola $4x^2 + 12x - 20y + 67 = 0$.

21. Evaluate : $\int \sqrt{\frac{5-x}{x-2}}\, dx$ on (2 , 5).

22. Evaluate : $\int \frac{dx}{\sin(x-a)\sin(x-b)}$ on $I \subset R \setminus (\{a + n\pi : n \in Z\} \cup \{b + n\pi : n \in Z\})$

23. Evaluate $\int_0^{\pi} \frac{x \sin x}{1+\sin x}\, dx$

24. Solve $\frac{dy}{dx} = \frac{2y + x + 1}{2x + 4y + 3}$.

PART-III

MATHEMATICS

GUESS PAPER 2

PAPER-II(B)

Time : 3 Hours | Max. Marks : 75

SECTION - A (10 × 2 = 20)

Note : (i) Answer **all** questions.

(ii) Each question carries **two** marks.

(iii) All are **Very Short Answer Type Questions.**

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1. Find the value of 'k' if the points (1, 3) and (2, k) are conjugate points with respect to the circle $x^2 + y^2 = 35$.

2. Find the equation of the circle whose center is (–1, 2) and which passes through (5, 6).

3. Find the equation of the radical axis of the circles $2x^2 + 2y^2 + 3x + 6y - 5 = 0$ and $3x2 + 3y^2 - 7x + 8y - 11 = 0$.

4. Find the value of 'k' if the line $2y = 5x + k$ is a tangent to the parabola $y^2 = 6x$.

5. If the lines $3x - 4y = 12$ and $3x + 4y = 12$ meets on a hyperbola $S = 0$, then find the eccentricity of the hyperbola $S = 0$.

6. Evaluate : $\int \frac{x^2 + 3x - 1}{2x} dx, x \in I \in R \setminus \{0\}$

7. Evaluate : $\int \cos mx \cos nx dx$ on R, $m \neq n$, m and n are positive integers.

8. Evaluate : $\int_0^1 \frac{dx}{\sqrt{3-2x}}$

9. Evaluate : $\int_2^3 \frac{2x}{1+x^2} dx$

10. Solve $\frac{dy}{dx} = e^{y-x}$

SECTION - B (5 × 4 = 20)

Note : Short answer type questions.

(i) Attempt any **five** questions.

(ii) Each question carries **four** marks.

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11. Find the condition that the tangents drawn from the exterior point (g, f) to S ≡ x2 + y2 + 2gx + 2fy + c = 0 are perpendicular to each other.

12. Find the equation of the common tangent of the following circles at their point of contact.

$x^2 + y^2 + 10x - 2y + 22 = 0$, $x^2 + y^2 + 2x - 8y + 8 = 0$.

13. Find the equation of the ellipse referred to its major and minor axes as the coordinate axes X, Y respectively with latus rectum of length 4, and distance between foci $4\sqrt{2}$.

14. Find the equations of tangent and normal to the ellipse $2x^2 + 3y^2 = 11$ at the point whose ordinate is 1.

15. Show that angle between the two asymptotes of a hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is $2\tan^{-1}\left(\frac{b}{a}\right)$ or $2\sec^{-1}(e)$.

16. Evaluate,

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$$

17. Solve $x\frac{dy}{dx} + 2y = \log x$

SECTION - C $(5 \times 7 = 35)$

Note : Long answer type questions.

(i) Attempt any **five** questions.

(ii) Each question carries **seven** marks.

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18. Find the transverse common tangents of the circles

$x^2 + y^2 - 4x - 10y + 28 = 0$ and $x^2 + y^2 + 4x - 6y + 4 = 0$.

19. Find all common tangents of the following pairs of circles.

$x^2 + y^2 = 9$ and $x^2 + y^2 - 16x + 2y + 49 = 0$.

20. Find the equations of tangents to the parabola $y^2 = 16x$ which are parallel and perpendicular respectively to the line $2x - y + 5 = 0$. Find the coordinates of the points of contact also.

21. Solve $\int \frac{dx}{x^3 + 1}$.

22. Obtain the reduction formula for $I_n = \int \operatorname{cosec}^n x dx$, n being a positive integer, $n \geq 2$ and deduce the value of $\int \operatorname{cosec}^5 x dx$.

23. Find the area enclosed between the curves $y = x^2 - 5x$ and $y = 4 - 2x$.

24. Solve $(2x + 2y + 3)\frac{dy}{dx} = x + y + 1$.

BOARD MODEL PAPER 2013 - 14
MATHEMATICS - IIB

Time : 3hrs **Max.Marks : 75**

SECTION-A

I. Very Short Answer type Questions

i) Answer all questions

ii) Each Question carries 2 marks **10 x 2 = 20**

1. If $ax^2 + bxy + 3y^2 - 5x + 2y - 3 = 0$ represents a circle, find the values of a and b. Also find its radius and centre.
2. State the necessary and sufficient condition for $lx + my + n = 0$ to be a normal to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$.
3. Find the angle between the circles $x^2 + y^2 - 12x - 6y + 41 = 0$ and $x^2 + y^2 + 4x + 6y - 59 = 0$.
4. Find the equation of the parabola whose focus is S(1, –7) and vertex is A(1, –2).
5. Find the angle between the asymptotes of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.
6. Evaluate $\int \frac{1}{(x+3)\sqrt{x+2}}\,dx$.
7. Evaluate $\int \frac{\sin^4 x}{\cos^6 x}\,dx$.
8. Evaluate $\int_0^1 \frac{x^2}{x^2+1}\,dx$.
9. Evaluate $\int_0^{\pi/2} \frac{\sin^2 x - \cos^2 x}{\sin^3 x - \cos^3 x}\,dx$.
10. Find the order and degree of the differential equation $\left[\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^3\right]^{6/5} = 6y$.

SECTION-B

II. Short Answer type Questions

i) Answer any five questions

ii) Each Question carries 4 marks **5 x 4 = 20**

11. Show that the tangent at (–1, 2) of the circle $x^2 + y^2 - 4x - 8y + 7 = 0$ touches the circle $x^2 + y^2 + 4x + 6y = 0$. Also find its point of contact.

12. Find the equation of the circle passing through the points of intersection of the circles $x^2+y^2-8x-6y+21=0, x^2+y^2-2x-15=0$ and $(1,2)$

13. Find the length of major axis, minor axis, latus rectum, eccentricity of the ellipse $9x^2+16y^2=144$.

14. Show that the point of intersection of the perpendicular tangents to an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1, (a>b)$ lies on a circle.

15. Find the equations of the tangents to the hyperbola $3x^2-4y^2=12$ which are (i) Parallel to (ii) perpendicular to the line $y=x-7$.

16. Find the reduction formula for $\int_0^{\pi/2} \sin^n x\,dx$.

17. Solve : $(1+y^2)\,dx=(\text{Tan}^{-1}y-x)\,dy$.

SECTION -C

III. Long Answer type Questions

i) Answer any five questions **5 x 7 = 35**

ii) Each Question carries 7 marks

18. Show that the points $(1,1), (-6,0), (-2,2)$ and $(-2,-8)$ are concyclic.

19. Find the direct common tangents to the circles $x^2+y^2+22x-4y-100=0, x^2+y^2-22x+4y+100=0$.

20. If y_1, y_2, y_3 are the y-coordinates of the vertices of the triangle inscribed in the parabola $y^2=4ax$ then show that the area of the triangle is $\frac{1}{8a}|(y_1-y_2)(y_2-y_3)(y_3-y_1)|$ square units.

21. Evaluate $\int \frac{9\cos x-\sin x}{4\sin x+5\cos x}dx$

22. Evaluate $\int \frac{dx}{(1+x)\sqrt{3+2x-x^2}}$.

23. Evaluate $\int_0^1 \frac{\log(1+x)}{1+x^2}dx$.

24. Solve : $\frac{dy}{dx}=\frac{2x+y+3}{2y+x+1}$