BOARD MODEL PAPER - 1

MATHS - 2B

(Board of Intermediate Education Model Paper)

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find the power of the point P(-1, 1) with respect to the circle $x^2 + y^2 - 6x + 4y - 12 = 0$.
2. State the necessary and sufficient condition for $lx + my + n = 0$ to be 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 (1, -7) and vertex is (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 $\int_0^{\pi/2} \frac{\sin x^2 x - \cos^2 x}{\sin x^3 x + \cos^3 x} dx$.
10. Find the order and degree to the differential equation $\left[\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3\right]^{\frac{6}{5}} = 6y$.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the pole of the line $3x + 4y - 45 = 0$ w.r.t the circle $x^2 + y^2 - 6x - 8y + 5 = 0$.
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, latusrectum, eccentricity of the ellipse of $9x^2 + 16y^2 = 144$.
14. Show that the point of intersection of the perpendicular to an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (a > b) lies on a circle.
15. Find the equation 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 : $(1 + y_2)\, dx = (\tan^{-1} y - x)\, dy$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : **[5 x 7 = 35]**

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 $\frac{1}{8} |(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)|$ square units.

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

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

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

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

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SOLVED MODEL PAPER - 2

MATHS - 2B

(Board of Intermediate Education Model Paper)

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find the Parametric equations of the circle $x^2 + y^2 + 6x + 8y - 96 = 0$.
2. Find the equation of normal at P(3, -4) on the circle $x^2 + y^2 + x + y - 24 = 0$.
3. Find k if the paris of circles are $x^2 + y^2 - 6x - 8y + 12 = 0$, $x^2 + y^2 - 4x + 6y + k = 0$ are orthogonal.
4. Find the coordinates of the point on the parabola $y^2 = 2x$ whose focal distance is 5/2.
5. If e, e_1 are the eccentricities of a hyperbola and its conjugate hyperbola, then prove that $\frac{1}{e^2} + \frac{1}{e_1^2} = 1$.
6. Evaluate $\int \sqrt{x} \log x \, dx$ on $(0, \infty)$.
7. Evaluate $\int e^x \left(\frac{1 + x \log x}{x} \right) dx$.
8. Evalute $\int_1^5 \frac{dx}{\sqrt{2x-1}} dx$.
9. Evaluate $\int_0^a \sqrt{a^2 - x^2} \, dx$.
10. Find the order and degree of the D.E $x^{1/2} \left(\frac{d^2y}{dx^2} \right)^{1/3} + x \frac{dy}{dx} + y = 0$.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the euqation of a circle which passes through (4, 1), (6, 5) and having the centre on $4x + 3y - 24 = 0$.
12. If the two circles $x^2 + y^2 + 2gx + 2fy = 0$, $x^2 + y^2 + 2g'x + 2f'y = 0$ touch each other, then show that $f'g = fg'$.
13. Find the equations of the tangent and normal tothe ellipse $9x^2 + 16y^2 = 144$ at the end of latusrect in the first quadrant.
14. Prove that the condition for the line $y = mx + c$ to be a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $c^2 = a^2m^2 + b^2$.
15. Find the centre, eccentricity, foci, length of latus rectuom and equations of the directrices of the Hyperbola $16y^2 - 9x^2 = 144$.
16. Evaluate $\int_{-3}^{+3} (9 - x^2)^{3/2} \, dx$.
17. Solve $\frac{dy}{dx} + \frac{y^2 + y + 1}{x^2 + x + 1} = 0$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

18. Find the equation of the circle passing through the three points (1, 2), (3, -4), (5, -6).

19. Show that the circles $x^2 + y^2 - 6x - 2y + 1 = 0$ and $x^2 + y^2 + 2x - 8y + 13 = 0$ touch each other. Find the point of contact and the equation of the common tangent at their point of contact.

20. Find the equation of the parabola whose axis is parallel to the y-axis and passing through the points (4, 5), (-2, 11), (-4, 21).

21. Evaluate $\int \frac{3\sin x + \cos x + y}{\sin x + \cos x + 1} dx$.

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

23. Let AOB be the positive quadrant of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with OA = a, OB = b. Then show that the area bounded between the chord AB and the arc AB of the ellipse is $\frac{(\pi - 2)ab}{4}$.

24. Solve $(x^2y - 2xy^2)\, dx = (x^3 - 3x^2y)\, dy$.

SOLVED MODEL PAPER - 3

MATHS - 2B

(Board of Intermediate Education Model Paper)

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find the equation of the circle passing through the point (-2, 14) and concentric with $x^2 + y^2 - 6x - 4y - 12 = 0$.
2. Find a if $2x^2 + ay^2 - 3x + 2y - 1 = 0$ represents a circle and also find its radius.
3. Find the angle between the circles given by the equations $x^2 + y^2 + 6x - 10y - 135 = 0$, $x^2 + y^2 - 4x + 14y - 166 = 0$.
4. Find the equation of the tangent and normal at the positive end of L.R on the parabola $y^2 = 6x$.
5. If the eccentricity of a hyperbola is 5/4, then find the eccentricity of its conjugate hyperbola.
6. Evaluate $\int \frac{1}{1+\sin 2x}\,dx$.
7. Evaluate $\int e^x(1+\tan^2 x+\tan x)\,dx$.
8. Evaluate $\int_0^{\pi/2} \frac{\sin^2 x-\cos^2 x}{\sin^3 x+\cos^3 x}\,dx$.
9. Find the area enclosed by the curves $y = x^2 + 1$, $y = 2x - 2$, $x = -1$, $x = 2$.
10. Find the general solution of $\frac{dy}{dx} = \frac{2y}{x}$.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the length of the chord intercepted by the circle $x^2 + y^2 - 8x - 2y - 8 = 0$ on the line $x + 1 + 1 = 0$.
12. If the straight line $2x + 3y = 1$ intersects the circle $x^2 + y^2 = 4$ at the points A and B, find the equation of the circle having AB as diameter.
13. Find the equations of the tangents to $9x^2 + 16y^2 = 144$, which make equal intercepts on the coordinate axes.
14. If PN is the ordinate of a point P on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and the tangent at P meets the x-axis at T then show that $(CN)(CT) = a^2$ where C is the centre of the ellipse.
15. Find the equation of the tangents to the hyperbola $x^2 - 4y^2 = 4$ which are
    i) parallel to and ii) perpendicular to the line $x + 2y = 0$.
16. Evaluate $\int_0^a x(a^2-x^2)^{7/2}\,dx$.
17. Solve $\frac{dy}{dx} - y\tan x = e^x \sec x$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

18. Show that the points (1, -6), (5, 2), (7, 0), (-1, -4) are concyclic and find the equation of the circle on which they lie.

19. If the chord of contact of a point P with respect to the circle $x^2 + y^2 = a^2$ with centre O is cutting the circle at A, B such that $\angle AOB = 90^0$, then show that P lies on the circle $x^2 + y^2 = 2a^2$.

20. Find the equation of the parabola whose focus is (-2, 3) and direcctrix is the line 2x + 3y - 4 = 0. Also find the length of the latusrectum and the equation of the axis of the parabola.

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

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

23. Evaluate $\int_0^1 x\,\mathrm{Tan}^{-1} x\,dx$.

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

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SOLVED MODEL PAPER - 4

MATHS - 2B

(Board of Intermediate Education Model Paper)

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. If the length of the tangent from (5, 4) to the circle $x^2 + y^2 + 2ky = 0$ is 1, then find k.
2. Find the equation of the polar of (1, -2) with respect to circle $x^2 + y^2 - 10x - 10y + 25 = 0$.
3. Find the radical centre of the circles $x^2 + y^2 + 4x - 7 = 0$, $2x^2 + 2y^2 + 3x + 5y - 9 = 0$ and $x^2 + y^2 + y = 0$.
4. Define latus rectum of a parabola. What is the length of the latus rectum of $y^2 = 4ax$?
5. Find the value of k if $3x - 4y + k = 0$ is a tangent to the hyperbola $x^2 - 4y^2 = 5$.
6. Evaluate $\int \sin mx \sin nx\, dx$.
7. Find $\int \frac{(\log x)^2}{x}\, dx$.
8. Evaluate $\int_{-\pi/2}^{\pi/2} \sin|x|\, dx$.
9. Find the value of $\int_0^{2\pi} \sin^2 x.\cos^4 x\, dx$.
10. Find the I.F. of the D.E. $(\cos x)\frac{dy}{dx} + y\sin x = \tan x$ by transforming it into linear form.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the condition that the tangents drawn from the exterior point (0, 0) to $S = x^2 + y^2 + 2gx + 2fc = 0$, are perpendicular to each other.
12. Show that the circles $x^2 + y^2 - 8x - 2y + 8 = 0$, $x^2 + y^2 - 2x + 6y = 0$ touch each other and find the point of contact.
13. Find the condition for the line $lx + my + n = 0$, to be a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
14. Prove that the equation of the chord joining the points α and β on the ellipse $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

    $$\frac{x}{a}\cos\left(\frac{\alpha+\beta}{2}\right) + \frac{y}{b}\sin\left(\frac{\alpha+\beta}{2}\right) = \cos\left(\frac{\alpha-\beta}{2}\right)$$

15. Prove that the point of intersection of two perpendicular tangents to the hyperbola $\frac{x^2}{a^2} + \frac{y^2}{b^2} = -1 = 0$, lies on the circle $x^2 + y^2 = a^2 - b^2$.
16. Find the area of the region enclosed by the curves $y = 4x - x^2$, $y = 5 - 2x$.
17. Solve $y^2\, dx + (x^2 - xy)\, dy = 0$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : **[5 x 7 = 35]**

18. Find the values of c if the points (1, 2), (3, -4), (5, -6), (c, 8) are concyclic.

19. Find the equations of circles which touch $2x - 3y + 1 = 0$ at (1, 1) and having radius $\sqrt{13}$.

20. Find the coordinates of vertex, focus, equation of the directrix and axis for the parabola $y^2 + 4x + 4y - 3 = 0$.

21. Evaluate $\int \frac{1}{1+\sin x+\cos x}\,dx$.

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

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

24. Solve the differential equation $(2x + y + 1)\,dx + (4x + 2y - 1)\,dy = 0$.

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PRACTICE MODEL PAPER - 5

MATHS - 2B

(Board of Intermediate Education Model Paper)

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. If $x^2 + y^2 + 2gx + 2fy - 12 = 0$ is a circle with centre (2, 3) then find (g, f) and its radius.
2. Find the value of k if the length of tangent from (5, 4) to $x^2 + y^2 + 2ky = 0$ is 1.
3. Find k if the pair of circles are $x^2 + y^2 + 2by - k = 0$, $x^2 + y^2 + 2ax + 8 = 0$.
4. Find the equation of tangent to the parabola $y^2 = 16x$. inclined at 60^0.
5. If e e_1 are the eccentricities of a hyperbola and its conjugate hyperbola, then prove that $\frac{1}{e^2} + \frac{1}{e_1^2} = 1$.
6. Evaluate $\int \sqrt[3]{\sin x}\ \cos\, dx$.
7. Evaluate $\int e^x(\tan x + \sec^2 x)dx$.
8. Evaluate $\int_0^1 x.e^{-x^2}\, dx$.
9. Evaluate $\int_0^{\pi/2} \frac{\sin^5 x}{\sin^5 x + \cos^5 x} dx$.
10. Find the order of the differential equation of the family of all circles with their centres at the origin.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the equations of the tangents to the circle $x^2 + y^2 - 4x + 6y - 12 = 0$ and parallel to the line $x + y - 8 = 0$.
12. Find the radical centre of the circles $x^2 + y^2 - 4x - 6y + 5 = 0$, $x^2 + y^2 - 2x - 4y - 1 = 0$, $x^2 + y^2 - 6x - 2y = 0$.
13. Find the equation of the ellipse, if focus = (1, -1), e = 2/3 and directrix is $x + y + 2 = 0$.
14. Find the equation of the ellipse in the standard form such that the distance between the foci is 8 and the distance between directrices is 32.
15. Tangents to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ make angles θ_1, θ_2 with transverse axis of a hyperbola. Show that the point of intersection of these tangents lies on the curve $2xy = k(x^2 - a^2)$ when $\tan\theta_1 + \tan\theta_2 = k$.
16. Find the area enclosed by the curves $y = x^2$ and $y = \sqrt{x}$.
17. Solve $\frac{dy}{dx} - x\tan(y - x) = 1$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : **[5 x 7 = 35]**

18. Find the equation of the circle passing through the points A(5, 7), B(8, 1), C(1, 3).

19. Show that the circles $x^2 + y^2 - 4x - 6y - 12 = 0$ and $x^2 + y^2 + 6x + 18y + 26 = 0$, touch each othe. Find the point of contact and common tangent.

20. Find the focus, vertex and equation of the directrix and the length of the latus rectum to the parabola $y^2 - x + 4y + 5 = 0$.

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

22. Evaluate the reduction formula for $I_n = \int \sin^n x \, dx$ and hence find $\int \sin^4 x \, dx$.

23. Evaluate $\int_0^{\pi/4} \frac{\sin x + \cos x}{9 + 16 \sin 2x} dx$.

24. Solve $(1 + x^2) \frac{dy}{dx} + 2xy - 4x^2 = 0$.

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PRACTICE MODEL PAPER - 6

MATHS - 2B

(Board of Intermediate Education Model Paper)

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find the Parametric equations of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$.
2. Find the value of k if the points (4, 2), (k, -3) are conjugate w.r.to the circle $x^2 + y^2 - 5x + 8y + 6 = 0$.
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 vertex, focus, equation of the directrix and axis of the parabola $y^2 = 16x$.
5. If the eccentricity of a hyperbola is 5/4, then find the eccentricity of its conjugate hyperbola.
6. Evaluate $\int \frac{x^8}{1+x^{18}}\,dx$.
7. Evaluate $\int e^x\left(\frac{1+x\log x}{x}\right)dx$
8. Evaluate $\int_0^{\pi}\sqrt{2+2\cos\theta}\,d\theta$.
9. Prove that $\int_0^{\pi/2}\sin^n x\,dx = \int_0^{\pi/2}\cos^n x\,dx$.
10. Form the D.E corresponding to $y = cx - 2c^2$ where c is a parameter.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the locus of P, where the tangents drawn from P to $x^2 + y^2 = a^2$ are perpendicular to eachother.
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 eccentricity, coordinates of foci, Length of latus rectum and equations of directrices of the ellipse $9x^2 + 16y^2 - 36x + 32y - 92 = 0$.
14. S and T are the foci of an ellipse and B is one end of the minor axis. If STB is an equilateral triangle, then find the eccentricity of the ellipse.
15. Find the euqations of the tangents to the hyperbola $3x^2 - 4y^2 = 12$ which are
    a) Parallel to b) Perpendicular to the line y = x - 7.
16. Evaluate $\int_0^{\pi/2}\frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}dx$.
17. Solve $(x^2 + y^2)\,dx = 2xydy$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : **[5 x 7 = 35]**

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

19. Find the equation to the pair of transverse common tangents to the circles $x^2 + y^2 - 4x - 10y + 28 = 0$ and $x^2 + y^2 + 4x - 6y + 4 = 0$.

20. Find the equation of the parabola whose focus is S(3, 5) and vertex is A(1, 3).

21. Evaluate $\int \frac{\sin x \cos x}{\cos^2 x + 3\cos x + 2}\, dx$.

22. Evaluate $\int \tan^n x\, dx$, hence evaluate $\int \tan^5 x\, dx$, $\int \tan^6 x\, dx$.

23. Find the area enclosed by the curves $y^2 = 4x$ and $y^2 = 4(4 - x)$.

24. Form the differential equation corresponding to the family of circles of radius r is given by $(x - a)^2 + (y - b)^2 = r^2$, where a abnd b are parameters.

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PRACTICE MODEL PAPER - 7

MATHS - 2B

(Board of Intermediate Education Model Paper)

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Show that A(-3, 0) lies on the circle $x^2 + y^2 + 8x + 12y + 15 = 0$. Also find the other end of the diameter through A.
2. Find the value of k if the points (4, k), (2, 3) are conjugate w.r.t. the circle $x^2 + y^2 = 17$.
3. Show that the angle between the circles $x^2 + y^2 = a^2$ $x^2 + y^2 = ax + ay$ is $3\pi/4$.
4. Find the equation of the parabola whose focus is (1, -7) & vertex is (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 $\int \sec^2 x . \csc^2 x \, dx$.
7. Evaluate $\int \text{Sin}^{-1} x \, dx$.
8. Evaluate $\int_0^4 \frac{x^2}{1+x} dx$.
9. Evaluate $\int_0^{\pi/2} \tan^5 x \cos^8 x \, dx$.
10. Find the I.F. of $x\frac{dy}{dx}$-y=2x2 $\sec^2 2x$ by transforming it into linear form.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Show tht 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 which cut orthogonally the circle $x^2 + y^2 - 4x + 2y - 7 = 0$ and having the centre at (2, 3).
13. Find the condition for the line lx + my + n = 0 to be a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = -1$.
14. If a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = -1$ (a > b) meets its major axis and minor axis at M and N respectively then prove that $\frac{a^2}{(CM)^2} + \frac{b^2}{(CN)^2} = 1$ where C is the centre of the ellipse.
15. A circle cuts the rectangular hyperbola xy = 1 in the point (x_r, y_r), r = 1, 2, 3, 4. Prove that $x_1 x_2 x_3 x_4 = y_1 y_2 y_3 y_4 = 1$.
16. Evaluate $\int_0^{\pi/2} x^2 \sin x \, dx$.
17. Solve $\frac{dy}{dx} + \frac{y}{x} = \frac{y^2}{x^2}$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : **[5 x 7 = 35]**

18. Find the values of c if the points (2, 0), (0, 1), (4, 5), (0, c) 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. Show that the common tangents to the circle $2x^2 + 2y^2 = a^2$ and the parabola $y^2 = 4ax$ intersect at the parabola $y^2 = -4ax$.

21. Evaluate $\int \frac{1}{(x-a)(x-b)(x-c)}\,dx$.

22. Find $\int x\sqrt{1+x-x^2}\,dx$.

23. Find the area of the region bounded by $y^2 = 4ax$ and $x^2 = 4by$.

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

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PRACTICE MODEL PAPER - 8

MATHS - 2B

(Board of Intermediate Education Model Paper)

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. if $x^2 + y^2 - 4x + 6y + c = 0$ represents a circle with radius 6, find the value of c.
2. Find the value of k if the points (1, 3), (2, k) are conjugate w.r.to the circle $x^2 + y^2 = 35$.
3. Find the equation of the common chord of $(x - a)^2 + (y - b)^2 = c^2$, $(x - b)^2 = c^2$, $(x - b)^2 + (y - a)^2 = c^2$.
4. Find the coordinates of the point on the parabola $y^2 = 8x$, whose focal distance is 10.
5. Find the value of k if $3x - 4y + k = 0$ is a tangent to the hyperbola $x^2 - 4y^2 = 5$.
6. Evaluate $\int \frac{1}{1+\cos x}\, dx$.
7. Find $\int \frac{\log(1+x)}{1+x}\, dx$.
8. Evaluate $\int_0^2 |1-x|\, dx$.
9. Find the area enclosed by $y = e^x$, $y = x$, $x = 0$, $x = 1$.
10. Find the order and degree to the differential equation $\left[\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^3\right]^{\frac{6}{5}} = 6y$.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. If a point P is moving such that the lengths of tangents drawn from P to the circles $x^2 + y^2 - 4x - 6y - 12 = 0$ and $x^2 + y^2 + 6x + 18y + 26 = 0$ are in the ratio 2 : 3 then find the equation of the locus of P.
12. If the angle between the circles $x^2 + y^2 - 12x - 6y + 41 = 0$, $x^2 + y^2 + kx + 6y - 59 = 0$ is 45^0, find k.
13. Find the euqations of the tangent to the ellipse $2x^2 + y^2 = 8$ which are
    a) parallel to $x - 2y - 4 = 0$ b) Perpendicular to $x + y + 2 = 0$
    c) make an angle 45^0 with x-axis.
14. Find the equations of the tangent and normal to the ellipse $2x^2 + 3y^2 = 11$ at the point whose ordinate is 1.
15. Find the centre, eccentricity, foci, length of latus rectum and equations of the directrices of the Hyperbola $x^2 - 4y^2 = 4$.
16. Find the area enclosed by the curve $y = x^2$ and $y = \sqrt{x}$.
17. Solve $(x + y + 1)\ \frac{dy}{dx} = 1$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

18. Find the equation of the circle whose centre lies on the x-axis and passing through (-2, 3) and (4, 5).

19. Find the equation of the circle which touches the circle $x^2 + y^2 - 4x + 6y - 12 = 0$ at (-1, 1) internally iwth a radius of 2.

20. From an external point P, tangents are drawn to the parabola $y^2 = 4ax$ and three tangents make angle θ_1, θ_2 with its axis, such that $\tan\theta_1 + \tan\theta_2$ is a constant b. Then show that P lies on the line y = bx.

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

22. Evaluate $\int \sqrt{\frac{5-x}{x-2}}\, dx$.

23. Show that $\int_0^{\pi/2} \frac{x}{\sin x + \cos x} dx = \frac{\pi}{2\sqrt{2}} \log(\sqrt{2}+1)$.

24. Solve $\frac{dy}{dx} = \frac{6x + 5y + 7}{2x + 18y - 14}$.

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PREVIOUS IPE MARCH - 2014

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find the equation of the circle pssing through the pint (-2, 14) and concentric with $x^2 + y^2 - 6x - 4y - 12 = 0$.
2. Find the parametric equation of the circle $x^2 + y^2 = 4$.
3. Show that the angle between the circles $x^2 + y^2 = a^2$, $x^2 + y^2 = ax + ay$ is $3\pi/4$.
4. Find the coordinates of the point on the parabola $y^2 = 8x$, whose focal distance is 10.
5. Define Rectangular Hyperbola and find its eccentricity.
6. Evaluate $\int \frac{1}{(x+3)\sqrt{x+2}}\,dx$
7. Evaluate $\int \frac{dx}{(x+1)(x+2)}\,dx$.
8. Evaluate $\int_0^{2\pi} \sin^2 x \cos^4 x\,dx$.
9. Evaluate $\int_0^{\pi/2} \frac{\sin^5 x}{\sin^5 x + \cos^5 x}\,dx$.
10. Find the order and degree of $\left(\frac{d^3y}{dx^3}\right)^2 - 3\left(\frac{dy}{dx}\right)^2 - e^x = 4$.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. If the abscissae of points A, B are the roots of the euqation $x^2 + 2ax - b^2 = 0$ 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. Show that the circles $x^2 + y^2 - 8x - 2y + 8 = 0$, $x^2 + y^2 - 2x + 6y + 6 = 0$ touch eachother and find the point of contact.
13. Find the eccentricity, foci, equation of directrices fo ellilpse $9x^2 + 16y^2 = 144$.
14. Find the condition for the line $x\cos\alpha + y\sin\alpha = p$ to be a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
15. Find the equation of the tangents to the hyperbola $x^2 - 4y^2 = 4$ which are
    i) Parallel to and ii) perpendicular to the line $x + 2y = 0$
16. Evaluate $\int_{\pi/6}^{\pi/3} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos s}}\,dx$.
17. Solve $\cos x \cdot \frac{dy}{dx} + y \sin x = \sec^2 x$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

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

19. Find the equation to the pair of transverse common tangnets to the circles $x^2 + y^2 - 4x - 10y + 28 = 0$ and $x^2 + y^2 + 4x - 6y + 4 = 0$.

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

21. Evaluate the reduction formular for $I_n = \int \sin^n x\, dx$ and hence find $\int \sin^4 x\, dx$.

22. Prove that the two parabolas $y^2 = 4ax$ and $x^2 = 4by$ intersect (other than the origin) at an angle of $\text{Tan}^{-1}\left[\frac{3a^{1/3}b^{1/3}}{2(a^{2/3} + b^{2/3})}\right]$.

23. Show that the area of the region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is πab. Hence deduce the area of the circle $x^2 + y^2 = a^2$

24. Given the solution of $x \sin^2 \frac{y}{x}\, dx - x\, dy$ which passes through the point $(1, \pi/4)$.

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PREVIOUS IPE MAY - 2014

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find the equation of the circle passing through the point (-2, 14) and concentric with $x^2 + y^2 + 8x + 12y + 15 = 0$.
2. Find the value of k if the points (4, 2), (k, -3) are conjugate w.r.to the circle $x^2 + y^2 - 5x + 8y + 6 = 0$.
3. Find the radical cnetre of the circles $x^2 + y^2 + 4x - 7 = -0$, $2x^2 + 3x + 5y - 9 = 0$ and $x^2 + y^2 + y = 0$.
4. If (1/2, 2) is one extremity of a focal chord of the parabola $y^2 = 8x$. Find the coordinates of the other extremity.
5. If the angle between teh asymptotes is 30^0 then find its eccentricity.
6. Evaluate $\int \frac{x^2+1}{x^4+1}\,dx$.
7. Evaluate $\int \frac{xe^x}{(x+1)^2}$.
8. Evaluate $\int_0^{\pi/4} \sin^4\theta\, d\theta$.
9. Evaluate $\int_{-\pi/2}^{\pi/2} \sin^3\theta\cos^3\theta\, d\theta$.
10. Form the differential equation corresponding to y = A cos3x + Bsin3x, where A and B are parameters.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the midpoint of the chord intercepted by $x^2 + y^2 - 2x - 10y + 1 = 0$ the line $x - 2y + 7 = 0$. Also find the length of the chord.
12. If the straight line $2x + 3y = 1$ intersects the circle $x^2 + y^2 = -4$ at the points A and B, then find the equation of the circle having Ab as its diameter.
13. If the normal at one end of a latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with eccentricity e, passes through one end of the minor axis, then show that $e^4 + e^2 = 1$.
14. The tangent and normal to the ellipse $x^2 + 4y^2 = 4$ at a point $P(\theta)$ on it meets the major axis in Q and R respectively. If $0 < \theta < \frac{\pi}{2}$ nd QR = 2.
15. Find the equation of the tangents to the hyperbola $x^2 - 4y^2 = 4$ which are
    i) parallel to and ii) perpendicular to the line $x + 2y = 0$.
16. Find the area of the region bounded by the parablolas $y^2 = 4x$ and $x^2 = 4y$.
17. Solve $x \log x \frac{dy}{dx} + y = 2 \log x$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

18. If (2, 0), (0, 1), (4, 5) and (0, c) are concyclic, then find c.

19. Prove that the combined equation of the pair of tangents drawn from an external point $P(x_1, y_1)$ to the circle $S = 0$ is $SS_{11} = S_1^2$.

20. If a normal chord a point 't' on the parabola $y^2 = 4ax$ subtends a right angle at vertex, then prove that $t = \pm \sqrt{2}$.

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

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

23. Evaluate $\int_0^{\pi} \frac{x \sin x}{1+\cos^2 x} dx$.

24. Solve $(x^3 - 3xy^2)\, dx + (3x^2u - y^3)\, dy = 0$.

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IPE : MARCH - 2015 (AP)

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find the value of 'a' if $2x^2 + ay^2 - 3x + 2y - 1 = 0$ represents a circle and also find its radius.
2. If the length of a tangent from (5, 4) tothe circle $x^2 + y^2 + 2ky = 0$ is '1', then find 'k'.
3. Find the equation of the common chord of the circles:
   $(x - a)^2 + (y - b(^2 = c^2$, $(x - b)^2 + (y - a)^2 = c^2$ $(a \neq b)$.
4. Find the co-ordinates of the points on the parabola " $yy^2 = 2x$ whose focal distance is $\frac{5}{2}$.
5. Define rectangular hyperbola and find its eccentricity.
6. Find $\int \frac{e^x(1+x\log x)}{x}dx$.
7. Find $\int \frac{\sin(\text{Tan}^{-1}x)}{1+x^2}dx,\ x \in R$.
8. Evaluate $\int_0^{\frac{\pi}{2}} \sin^5 x \cos^4 x\ dx$.
9. Evaluate $\int_0^2 |1-x|\ dx$.
10. From the differential equation corresponding to $y = A\cos 3x + B \sin 3x$, where A and B are parameters.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the equation of circle whose centre lies on the x-axis and passing thrugh (-2, 3) and (4, 5).
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 tangent and normal to the ellipse $9x^2 + 16y^2 = 144$ at the end of the latus rectum in the first quadrant.
14. Find the value of 'k' if $4x + y + k = 0$ is a tangent to the ellipse $x^2 + 3y^2 = 3$.
15. Find the equation of the tangents to the hyperbola $3x^2 - 4y^2 = 12$ which are
    i) parallel and ii) perpendicular to the line $y = x - 7$.
16. Find $\int_0^{\frac{\pi}{2}} \frac{dx}{4+5\cos x}\ dx$.
17. Solve the differential equation $(xy^2 + x)\ dx + (yx^2 + y)\ dy = 0$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

18. If (2, 0), (0, 1), (4, 5) and (0, c) are concyclic, then find c.

19. Find the transverse common tangents of the circles $x^2 + y^2 - 4x - 10y + 28 = 0$ and $x^2 + y^2 + 4x - 6y + 4 = 0$

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

21. Obtain reduction formula $\int \tan^n x\, dx$ for integer $n \geq 2$ and evaluate $\int \tan^6 x\, dx$.

22. Derive the standard form of the parabola.

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

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

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IPE : MARCH - 2015 (TS)

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. If the length of the tangent from (5, 4) to the circle $x^2 + y^2 + 2ky = 0$ is 1, then find k.
2. Find the equation of the polar of (1, -2) with respect to circle $x^2 + y^2 = 10x - 10y + 25 = 0$.
3. Findthe angle between the circles $x^2 + y^2 - 12xx - 6y + 41 = 0$ and $x^2 + y^2 + 4x + 6y - 59 = 0$.
4. Find the equation of parabola whose focus is S(1, -7) and vertex is A(1, -2).
5. If the eccentricity of a hyperbola is $\frac{5}{4}$, then find the eccentricity of its conjugate hyperbola.
6. Evaluate $\int \frac{\text{Log}(1+x)}{1+x}dx$ on $(-1, \infty)$.
7. Evaluate $\int \frac{1}{1+\cos x}dx \text{ on } I \subset R - \{(2n+1)\pi : n \in z\}$.
8. Evaluate $\int_1^5 \frac{dx}{\sqrt{2x-1}}$.
9. Find the value of $\int_0^{2\pi} \sin^2 x.\cos^4 x\,dx$.
10. Find the order and degree of the differential equation $x^{1/2}\left(\frac{d^2y}{dx^2}\right)^{1/3} + x.\frac{dy}{dx} + y = 0$.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the equation of circle whose centre lies on the x-axis and passing through the points (-2, 3) nd (4, 5).
12. Show that the circle $S = x^2 + y^2 - 2x - 4y - 20 = 0$, $S' = x^2 + y^2 + 6x + 2y - 90 = 0$ touch each other internally. Find their point of contact.
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 eccentricity and length of latus rectum of the ellipse $9x^2 + 16y^2 - 36x + 32y - 92 = 0$.
15. Find the equation of the tangent to the hyperbola $x^2 - 4y^2 = 4$ which are
    i) parallel and ii) perpendicular to the line $x + 2y = 0$
16. Obtain the reduction formula for $\int_0^{\pi/2} \sin^n x.dx$ for an integer $n \geq 2$.
17. Solve the differential equation $(1 + x^2)\frac{dy}{dx} + y = e^{\text{Tan}^{-1}x}$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : **[5 x 7 = 35]**

18. If (2, 0), (0, 1), (4, 5) and (0, c) are concyclic, then find c.

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

20. Prove that the area of the triangle formed by the tangents at (x_1, y_1), (x_2, y_2) and (x_3, y_3) to the parabola $y^2 = 4ax$ $(a > 0)$ is

21. Evaluate $\int \frac{1}{1+\sin x+\cos x}\,dx$.

22. Evaluate $\int \frac{2x+5}{\sqrt{x^2-2x+10}}\,dx$.

23. Evaluate $\int_0^{\pi} \frac{x\sin^3 x}{1+\cos^2 x}\,dx$.

24. Solve the differential equation $(2x - y + 1)\,dx + (4x + 2y - 1)\,dy = 0$.

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IPE : MAY - 2015 (TS)

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find the equation of circle passing through (-2, 3) and having centre at (0, 0).
2. Find the value of k if the length of tangent from (5, 4) to $x^2 + y^2 + 2ky = 0$ is 1.
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 (1, -7) & vertex is (1, -2).
5. If the eccentricity of a hyperbola is 5/4, then find the eccentricity of its conjugate hyperbola.
6. Evaluate $\int\left(x+\frac{4}{1+x^2}\right)dx$.
7. Evaluate $\int e^x(\tan x+\log\sec x)dx$.
8. Evaluate $\int_0^{\pi}\sin^3 x\cos^3 x\,dx$.
9. Evaluate $\int_0^4\frac{x^2}{1+x}dx$.
10. Find the order and degree to the differential equation $\left[\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^3\right]^{\frac{6}{5}}=6y$.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the value of k if $kx + 3y - 1 = 0$ and $2x + y + 5 = 0$ are conjugate with respect to the circle $x^2 + y^2 - 2x - 4y - 4 = 0$.
12. Find the equation of the circle passing through the point (0, -3) and cutting orthogonally the circles $x^2 + y^2 - 6x + 3y + 5 = 0$, $x^2 + y^2 - x - 7y = 0$.
13. Find the eccentricity, coordinates of foci, Length of latus rectum and equations of directrices of the ellipse $9x^2 + 16y^2 - 36x + 32y - 92 = 0$.
14. Find the euqations of the tangent and normal tothe ellipse $9x^2 + 16y^2 = 144$, which make equal intercepts on the coordinate axes.
15. Find the equation 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. Evaluate $\int_0^{\pi/4}\frac{\sin x+\cos x}{9+16\sin 2x}dx$.
17. Solve $\frac{dy}{dx}-x\tan(y-x)=1$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

18. Find the equation of the circle passing through the three points (1, 2), (3, -4), (5, -6) and (19, 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. Prove that the area of the triangle insecribed in the parabola $y^2 = 4ax$ with vertices (x_1, y_2), (x_2, y_2), (x_3, y_3) is $\frac{1}{8a} |(y_1 - y_2), (y_2 - y_3) (y_3 - y_1)|$ sq. units.

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

22. If $I_n = \int \sec^n dx$ then prove that $I_n = \int \frac{\sec^{n-2} x \tan x}{n-1} + \frac{(n-2)}{n-1} I_{n-2}$.

23. Evaluate $\int_0^{\pi/2} \frac{\sin^2 x}{\cos x + \sin x} dx$.

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

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IPE : MARCH - 2016 (AP)

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. If hte circle $x^2 + y^2 - 4x + 6y + a = 0$ has radius 4 then find a.
2. Obtain parametric equations of the circle $(x - 3)^2 + (y - 4)^2 = 8^2$.
3. Find k if the pairs of circles $x^2 + y^2 + 4x + 8 = 0$, $x^2 + y^2 - 16y + k = 0$ are orthogonal.
4. Find the coordinates of the points on the parabola $y^2 = 8x$, whose focal distance is 10.
5. If the eccentricity of a hyperbola is 5/4, then find the eccentricity of its conjugate hyperbola.
6. Evaluate $\int \frac{1}{\cosh x + \sinh x} dx$.
7. Evaluate $\int \frac{x^8}{1+x^{18}} dx$.
8. Evaluate $\int_{-\pi/2}^{\pi/2} \sin^2 x . \cos^4 x \, dx$.
9. Evaluate $\int_0^{\pi} \sqrt{2 + 2\cos\theta} \, d\theta$.
10. Find the order and degree to the differential equation $\left[\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^3\right]^{\frac{6}{5}} = 6y$.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the pole of the line $3x + 4y - 45 = 0$ w.r.to the circle $x^2 + y^2 - 6x - 8y + 5 = 0$.
12. Find the equation of the circle which cuts the circles $x^2 + y^2 + 4x - 6y + 11 = 0$ and $x^2 + y^2 - 10x - 4y + 21 = 0$ orthogonally and has the diameter along the straight line $2x + 3y = 7$.
13. Show that the points of intersection of the perpendicular tangents to an ellipse lie on a circle.
14. Find the value of k if $4x + y + k = 0$ is a tangent to the ellipse $x^2 + 3y^2 = 3$.
15. Find the centre, foci, eccentricity, equation of directrices of the Hyperbola $x^2 - 4y^2 = 4$.
16. Evaluate $\int_0^{\pi/2} \frac{dx}{4 + 5\cos x}$.
17. Solve $(1 + x^2) \frac{dy}{dx} + y = e^{\text{Tan}^{-1}x}$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

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

19. Show that the circles $x^2 + y^2 - 6x - 2y + 1 = 0$ and $x^2 + y^2 + 2x - 8y + 13 = 0$ touch each other. Find the point of contact and the equation of the common tangent at their point of contact.

20. Show that the common tangent to the parabola $y^2 = 4ax$ and $x^2 = 4by$ is $xa^{1/3} + yb^{1/3} + a^{2/3} b^{2/3} = 0$.

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

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

23. Evaluate $\int_0^{\pi/4} \log(1 + \tan x)\, dx$.

24. Solve the differential equation $(x^2 + y^2)\, dx = 2xydy$.

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IPE : MARCH - 2016 (TS)

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find the power of the point P(-1, 1) with respect to the circle $x^2 + y^2 - 6x + 4y - 12 = 0$.
2. Find the value of k if the points (1, 3), (2, k) are conjugate w.r.to the circle $x^2 + y^2 = 35$.
3. Find k if the paris of circles are $x^2 + y^2 - 4x + 8 = 0$ and $x^2 + y^2 - 6y + k = 0$ are orthogonal.
4. Find the value of k, if the line $2y = 5x + k$ is a tangent to the parabola $y^2 = 6x$.
5. Find the equation of the hyperbola whose foci are $(\pm 5, 0)$, the transverse axis is of length 8.
6. Evaluage $\int \sqrt{x} \log x \, dx$ on $(0, \infty)$.
7. Evaluate $\int \sec^2 x . \operatorname{cosec}^2 x \, dx$ on $I \subset R \left(\{n\pi : n \in z\} \cup \{(2n+1)\frac{\pi}{2} : n \in Z\} \right)$.
8. Evaluate $\int_2^3 \frac{2x}{1+x^2} \, dx$.
9. Evaluate $\int_0^a \sqrt{a^2 - x^2} \, dx$.
10. Form the differential equation corresponding to the family of curves $y = c (x - c)^2$, where c is a parameter.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the length of the chord intercepted by the circle $x^2 + y^2 - 8x - 2y - 8 = 0$ on the line $x + y + 1 = 0$.
12. If the two circles $x^2 + y^2 + 2gx + 2fy = 0$, $x^2 + y^2 + 2g'x + 2f'y = 0$ touch each other, then show that $f'g = fg'$.
13. Find the eccentricity, foci, length of the Latus rectum and the equation of directrices of the ellipse $9x^2 + 16y^2 = 144$.
14. Find the equations of the tangent and normal to the ellipse $2x^2 + 3y^2 = 11$ at the point whose ordinate is 1.
15. Prove that the point of intersection of two perpendicular tangents to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1 = 0$, lies on the circle $x^2 + y^2 = a^2 - b^2$.
16. Find the area of the region enclosed by the curves $y = 4x - x^2$, $y = 5 - 2x$.
17. Solve the differential equation $\frac{dy}{dx} + y \tan x = \sin x$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

18. Find the equation of the circle passing through the three points (1, 2), (3, -4), (5, -6).

19. Find the pair of tangents drawn from (1, 3) to the circle $x^2 + y^2 - 2x + 4y - 11 = 0$ and also find the angle between them.

20. Show that the equation of the parabola in standard form is $y^2 = 4ax$.

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

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

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

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

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IPE : MAY - 2016 (AP)

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. If the length of the tangent from (5, 4) to the circle $x^2 + y^2 + 2ky = 0$ is 1, then find k.
2. Find the pole of $ax + by + c = 0$ $(c \neq 0)$ with respect to $x^2 + y^2 = t^2$.
3. Find the equation of the radical axis of the circles $x^2 + y^2 - 2x - 4y - 1 = 0$, $x^2 + y^2 - 4x - 6y + 5 = 0$.
4. Find the equation of tangent to the parabola $y^2 = 16x$ inclined at an angle 60^0 with its axis.
5. If the eccentricity of a hyperbola is 5/4, then find the eccentricity of its conjugate hyperbola.
6. Evaluate the integral $\int \frac{(3x+1)^2}{2x} dx$, $x \in I \subset R / \{0\}$
7. Evaluate the integral $\int e^x (\sec x + \sec x \tan x) dx$.
8. Evaluate $\int_0^{\pi} \sqrt{2 + 2\cos\theta}\, d\theta$
9. Evaluate the definite intergral $\int_0^{\pi/2} \sin^6 x . \cos^4 x\, dx$.
10. Find the general solution of $x + y \frac{dy}{dx} = 0$.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the length of the chord intercepted by the circle $x^2 + y^2 - x + 3y - 22 = 0$ onthe 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 $\overline{AB}$ as diameter.
13. Find the equation of the ellipse, if focus at = (1, -1), e = 2/3 and directrix is $x + y + 2 = 0$.
14. The tangent and normal to the ellipse $x^2 + 4y^2 = 4$ at a point $P(\theta)$ on it meets the major axis in Q and R respectively. If $0 < \theta < \pi/2$ and QR = 2, then show that = $\theta = \cos^{-1}\left(\frac{2}{3}\right)$.
15. Find the centre, foci, eccentriicty, equation of the directrices of the hyperbola $x^2 - 4y^2 = 4$.
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

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

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

19. Show that the circles $x^2 + y^2 - 6x - 2y + 1 = 0$ and $x^2 + y^2 + 2x - 8y + 13 = 0$ touch each other. Find the point of contact and the equation of the common tangent at their point of contact.

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

21. Evaluate hte integral $\int \frac{x+1}{x^2+3x+12} dx$.

22. Obtain reduction formula $\int \tan^n x \, dx$ for integer $n \geq 2$ and evaluate $\int \tan^6 x \, dx$.

23. Evaluate the integral $\int_0^{\pi} \frac{x \sin x}{1+\cos^2 x} dx$.

24. Find the equation of a curve whose gradient is $\frac{dy}{dx} = \frac{y}{x} - \cos^2\left(\frac{x}{y}\right)$, where x > 0, y > 0 and which passes through the point $\left(1, \frac{\pi}{4}\right)$.

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IPE : MAY - 2016 (TS)

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find the length of the tangent from (-2, 5) to the circle $x^2 + y^2 - 25 = 0$.
2. Find the length of the chord formed by $x^2 + y^2 = a^2$, on the line $x\cos\alpha + y\sin\alpha = p$.
3. Show that the angle between the circles $x^2 + y^2 = ax + ay$ is $\frac{3\pi}{4}$.
4. If $\left(\frac{1}{2}, 2\right)$ is one extremity of a focal chord of the parabola $y^2 = 8x$. Find the coordinates of the other extremity.
5. Find the product of lengths of the perpendiculars from any point on the $\frac{x^2}{16} - \frac{y^2}{9} = 1$ hyperbola to its asymptotes.
6. Evaluate $\int \frac{e^x(1+x)}{\cos^2(xe^x)}dx$.
7. Evaluate on $\int\left(\frac{1}{1+x^2} + \frac{1}{1+x^2}\right)dx$ on (-1, 1).
8. Evaluate $\int_0^2 |1-x|\,dx$.
9. Find the area bounded by the parabola $y = x^2$ the x-axis and the lines $x = -1$, $x = 2$.
10. Form the differential equation corresponding to $y = A\cos 3x + B\sin 3x$, where A and B are parameters.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the condition that the tangents drawn from (0, 0) to $S = x^2 + y^2 + 2gx + 2fy + c = 0$ be perpendicular to eachother.
12. Find the readical center of the circles $x^2 + y^2 + 4x - 7 = 0$, $2x^2 + 2y^2 + 3x + 5y - 9 = 0$ and $x^2 + y^2 + y = 0$.
13. Prove that the equation of the chord joining the points α and β on the ellipse $\frac{x}{a^2} - \frac{y^2}{b^2} = 1$ is $\frac{x}{a}\cos\left(\frac{\alpha+\beta}{2}\right) + \frac{y}{b}\sin\left(\frac{\alpha+\beta}{2}\right) = \cos\left(\frac{\alpha-\beta}{2}\right)$.
14. Find the equation of tangent and normal to the ellipse $x^2 + 8y^2 = 33$ at (-1, 2).
15. Tangents to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ make angles θ_1, θ_2 with transverse axis of a hyperbola. Show that the point of intersection of these tangents lies on the curve $2xy = k(x^2 - a^2)$ when $\tan\theta_1 + \tan\theta_2 = k$.
16. Find $\int_{-\pi/2}^{\pi/2} \sin^2 x\cos^4 x\,dx$.
17. Solve $\frac{dy}{dx} = \frac{xy+y}{xy+x}$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : [5 x 7 = 35]

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

19. Find the equation of the circle which touches the circle $x^2 + y^2 - 2x - 4y - 20 = 0$ externally at (5, 5) with radius 5.

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

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

22. If $I_n = \int \cos^n x \, dx$, then show that $I_n = \frac{1}{n} \cos^{n-1} x \sin x + \frac{n-1}{n} I_{n-2}$ n being a positive integer $n \geq 2$.

23. Evaluate $\int_0^{\pi/4} \log(1 + \tan x) dx$

24. Find the equation of a curve whose gradient is $\frac{dy}{dx} = \frac{y}{x} - \cos^2\left(\frac{x}{y}\right)$, where x > 0, y > 0 and which passes through the point $\left(1, \frac{\pi}{4}\right)$.

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IPE : MARCH - 2017 (AP)

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Find teh equation of circle with centre (1, 4) and radius 5.
2. Find the value of k if the points (1, 3), (2, k) are conjugate w.r.to the circle $x^2 + y^2 = 35$.
3. Find the equation of the radical axis of the circles $2x^2 + 2y^2 + 3x + 6y - 5 = 0$, $3x^2 + 3y^2 - 7x + 8y - 11 = 0$.
4. Find the coordinates of the point on the parabola $y^2 = 8x$, whose focal distance is 10.
5. If the eccentricity of a hyperbola is 5/4, then find the eccentricity of its conjugate hyperbola.
6. Evaluate $\int e^x \sin e^x dx$.
7. Evaluate $\int e^x(\sin x + \cos x)dx$.
8. Evaluate $\int_2^3 \frac{2x\,dx}{1+x^2}$.
9. Evaluate $\int_0^{\pi/2} \sin^7 x\, dx$.
10. Find the general solution of $\frac{dy}{dx} = \frac{2y}{x}$.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. Find the pole of the line $x + y + 2 = 0$ w.r.t. the circle $x^2 + y^2 - 4x + 6y - 12 = 0$.
12. Find the equation and length of the common chord of the two circles $x^2 + y^2 + 2x + 2y + 1 = 0$ and $x^2 + y^2 + 4x + 3y + 2 = 0$.
13. Find the length of latus rectum, eccentricity, co-ordinates of centre and foci of the ellipse $9x^2 + 16y^2 = 144$.
14. Show that the locus of the feet of the perpendiculars drawn from either of the foci to any tangent to the ellipse is the auxillary circle.
15. Find the equations of the tangents to the hyperbola $3x^2 - 4y^2 = 12$. which are
    i) parallel and ii) perpendicular to the line $y = x - 7$.
16. Evaluate $\int_0^{\pi/2} \frac{\sin^5 x}{\sin^5 x + \cos^5 x} dx$.
17. Solve the differential equation $\frac{dy}{dx} + y \tan x = \cos^3 x$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : **[5 x 7 = 35]**

18. If (2, 0), (0, 1), (4, 5) and (0, c) are concyclic then find c.

19. Show that the circles $x^2 + y^2 - 4x - 6y - 12 = 0$ and $x^2 + y^2 + 6x + 18y + 26 = 0$ touch each other. Find the point of contact and common tangent.

20. Show that the equation of the parabola in the standard form is $y^2 = 4ax$.

21. Evaluate $\int \frac{x+1}{x^2+3x+12}$.

22. Obtain 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 $\int_0^{\pi/4} \frac{\sin x + \cos x}{9 + 16\sin 2x}\,dx$.

24. Solve the differential equation $(x^2 + y^2)\,dx = 2xydy$.

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IPE : MARCH - 2017 (TS)

MATHS - 2B

SECTION - A

I. Answer ALL the following Very Short Answer Questions: [10 x 2 = 20]

1. Obtain the parametric equation of the circle $4(x^2 + y^2) = 9$.
2. Find the value of k if the points (4, 2), (k, -3) are conjugate w.r.to the circle $x^2 + y^2 - 5x + 8y + 6 = 0$.
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 coordinates of the point on the parabola $y^2 = 8x$, whose focal distance is 10.
5. Find the value of k if $3x - 4y + k = 0$ is a tangent to the hyperbola $x^2 - 4y^2 = 5$.
6. Evaluate $\int \frac{1}{\cosh x + \sinh x} dx$.
7. Evaluate $\int \frac{e^x(1+x)}{\cos^2(xe^x)} dx$.
8. Evaluate $\int_{-\pi/2}^{\pi/2} \sin|x| \, dx$.
9. Evaluate $\int_0^3 \frac{x}{\sqrt{x^2+16}} dx$.
10. Find the order of the differential equation of the family of all circles with their centres at the origin.

SECTION - B

II. Answer any FIVE of the following Short Answer Questions: [5 x 4 = 20]

11. If a point P is moving such that hte lengths of tangents drawn form P to the circles $x^2 + y^2 - 4x - 6y - 12 = 0$ and $x^2 + y^2 + 6x + 18y + 26 = 0$ are in the ratio 2 : 3 then find the equation of the locus of P.
12. Find the equation and length of the common chord of the two circles $x^2 + y^2 + 2x + 2y + 1 = 0$ and $x^2 + y^2 + 4x + 3y + 2 = 0$.
13. Find the equation of ellipse in the standard form, if passes through the points (-2, 2) nd (3, -1).
14. Find the equations of the tangent to the ellipse $2x^2 + y^2 = 8$ which are
    i) Paralle to $x - 2y - 4 = 0$ ii) perpendicualr to $x + y + 2 = 0$
15. if e e_1 are the eccentricities of a hyperbola and its conjugate hyperbola then prove that $\frac{1}{e^2} + \frac{1}{e_1^2} = 1$.
16. Find the area of the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$.
17. Solve $(x + y + 1)\frac{dy}{dx} = 1$.

SECTION - C

III. Answer any FIVE of the following Long Answer Questions. : **[5 x 7 = 35]**

18. If (2, 0), (0, 1), (4, 5) and (0, c) are concyclilc then find c.

19. Find the equation to the pair of transverse common tangents to the circles $x^2 + y^2 - 4x - 10y + 28 = 0$ and $x^2 + y^2 + 4x - 6y + 4 = 0$.

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 $I_n = \frac{1}{n}\cos^{n-1} x \sin x + \frac{n-1}{n} I_{n-2}$ and hence deduce the value of $\int \cos^4 x\, dx$.

23. Show that $\int_0^{\pi/2} \frac{x}{\sin x + \cos x} dx = \frac{\pi}{2\sqrt{2}} \log(\sqrt{2} + 1)$.

24. Solve the differential equation (x - y) dy = (x + y + 1) dx.

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