Corporate Office: 214-17, Naurang House, Opp. Hindustan Times, 21, K.G. Marg, Connaught Place, New Delhi-01.
Ph.: 011-51510891/92/93 Fax: 011-51518999
Registered Office: Race Course Road, Indore.
Email: login@ptindia.com Web: www.ptindia.com

Pre MPMCA
April 10, 2005

We are very pleased to present you the detailed analysis of Pre MPMCA entrance test held on April 10, 2005 on various centres all over India. Like last year this year also the test comprised 100 questions, to be solved in a time span of 120 minutes. (This is a combined effort of more than 20 faculty members and more than 75 number of students appeared for the entrance test. All these questions have been memorised by PT students and given to us.)

Bird's eye view :

Total Number of Questions	:	100
Total Time	:	120 minutes.
The Marking Scheme	:	3 marks for each correct answer.
		Negative marking was not mentioned.
Number of options	:	Four

A Bird's Eye-View of MP - Pre MCA 2005

Coordinate Geometry	: 20
Differential Calculus	: 12
Integral Calculus	: 12
Algebra	: 5
Statistics	: 5
Computers	: 9
Numerical Analysis	: 12

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Disclaimer: All these questions have been memorised by PT students. We are merely reproducing a few of them here in fragments to ensure that the huge community of students eagerly waiting to see an objective comparison of their performance gets the right picture.

Detailed Analysis

DIRECTIONS: *For the following questions choose the correct option*

1. Equation of the circle, with centre (1, 2) and tangent $x + y - 5 = 0$ is
   (A) $x^2 + y^2 - 2x - 4y + 3 = 0$
   (B) $x^2 + y^2 - 2x - 4y - 3 = 0$
   (C) $x^2 + y^2 - 2x + 4y - 3 = 0$
   (D) $x^2 + y^2 + 2x - 4y - 3 = 0$

Sol. Radius = $\left|\frac{1+2-5}{\sqrt{2}}\right| = \sqrt{2}$. Equation of the circle is $(x - 1)^2 + (y - 2)^2 = 2$

$\Rightarrow x^2 + y^2 - 2x - 4y + 3 = 0$. **Ans.(A)**
Lots of similar questions were solved in PT's class room.

2. If $y = mx + c$ is tangent to the circle $x^2 + y^2 = a^2$ then
   (A) $c = -a\sqrt{1+m^2}$
   (B) $c = a\sqrt{1+m^2}$
   (C) $c = \pm a\sqrt{1+m^2}$
   (D) None of these

Sol. $c^2 = a^2(1 + m^2) \Rightarrow c = \pm a\sqrt{1+m^2}$. **Ans.(C)**
Standard Result

3. If two circles $x^2 + y^2 + 2gx + 2fy + c = 0$ and $x^2 + y^2 + 2g'x + 2f'y + c' = 0$ cut orthogonally then
   (A) $2gg' + 2ff' = c - c'$
   (B) $2gg' + 2ff' = c + c'$
   (C) $2gg' - 2ff' = c + c'$
   (D) $2gg' - 2ff' = c - c'$

Sol. $2gg' + 2ff' = c + c'$. **Ans.(B)**
Standard Results

4. If A = $\begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then A^2 is
   (A) $\begin{bmatrix} 8 & -2 \\ 3 & 0 \end{bmatrix}$
   (B) $\begin{bmatrix} 4 & -2 \\ 2 & 0 \end{bmatrix}$
   (C) $\begin{bmatrix} 8 & -2 \\ 2 & 2 \end{bmatrix}$
   (D) $\begin{bmatrix} 8 & -2 \\ 2 & 0 \end{bmatrix}$

Sol. A = $\begin{bmatrix} 3 & -1 \\ 1 & -1 \end{bmatrix} \Rightarrow A^2 = \begin{bmatrix} 3 & -1 \\ 1 & -1 \end{bmatrix}\begin{bmatrix} 3 & -1 \\ 1 & -1 \end{bmatrix} = \begin{bmatrix} 8 & -2 \\ 2 & 0 \end{bmatrix}$. **Ans.(D)**

5. Which statement is false?

(A) The radical axis of the two circle is perpendicular to the lines of centre.

(B) The radicals of three circles taken in pairs meet in a point.

(C) System of co-axial circle in the simplest form is $x^2 + y^2 + 2g'x + c = 0$.

(D) The equation of normal to the circle $x^2 + y^2 = a^2$ at the point (x_1, y_1) is $(xy_1 + yx_1) = 0$.

Sol. **Ans.(D)**

6. The equation of parabola with vertex at (3, 2) and focus at (5, 2) is

(A) $y^2 - 4y - 8x + 28$

(B) $y^2 - 4y - 8x - 28$

(C) $y^2 - 4y - 8x - 20$

(D) $y^2 - 4y - 8x + 20$

Sol. Check from options. $y^2 - 4y - 8x + 20$. **Ans.(A)**

7. The equation of normal at the point $(am^2, -2am)$ to the parabola $y^2 = 4ax$ is

(A) $y = mx - 2am - am^3$

(B) $y = mx - 2am + am^3$

(C) $y = mx + 2am + am^3$

(D) $y = mx + 2am - am^3$

Sol. **Ans.(A)**

Standard Result

8. The equation of parabola with its centre at origin, axis on y-axis and which passes through the point (6, –3) is

(A) $x^2 = -12y$

(B) $x^2 = 6y$

(C) $x^2 = -6y$

(D) $x^2 = -24y$

Sol. Check from options. **Ans.(A)**

9. The parametric equation of the parabola $y^2 = 12x$ is

(A) $x = 3t^2, y = -6t$

(B) $x = 6t^2, y = -6t$

(C) $x = 3t^2, y = -3t$

(D) $x = 6t^2, y = -3t$

Sol. $\frac{x}{3} = t^2, t = \frac{-y}{6} \Rightarrow y^2 = 12x$. **Ans.(A)**

10. The latus rectum of the ellipse is $x^2/a^2 + y^2/b^2 = 1$ is

(A) $2b^2/a$

(B) b^2/ac

(C) $2b^2/ac$

(D) None of these

Sol. **Ans.(A)**

11. The eccentricity of the ellipse $3x^2 + 4y^2 = 12$ is

(A) 1/4

(B) 1/3

(C) 1/2

(D) None of these

Sol. $\frac{x^2}{4} + \frac{y^2}{3} \Rightarrow 1 \Rightarrow 3 = 4(1 - e^2)$

$\Rightarrow e^2 = 1 - \frac{3}{4} \Rightarrow e^2 = \frac{1}{4} \Rightarrow e = 1/2$. **Ans.(C)**

12. Let CP and CE be two conjugate semidiametres of the ellipse $x^2/a^2 + y^2/b^2 = 1$ then $CP^2 + CD^2$ is equal to
   (A) $a + b$
   (B) $a - b$
   (C) $a^2 + b^2$
   (D) $a^2 - b^2$

Sol. **Ans.(C)**

13. The condition that the line x cosa + y sina = p may be a normal to the ellipse $x^2/a^2 + y^2/b^2 = 1$ is

   (A) $\frac{a^2}{\cos^2\alpha} + \frac{b^2}{\sin^2\alpha} = \frac{(a^2+b^2)^2}{P^2}$

   (B) $\frac{a^2}{\cos^2\alpha} - \frac{b^2}{\sin^2\alpha} = \frac{(a^2-b^2)^2}{P^2}$

   (C) $\frac{a^2}{\cos^2\alpha} - \frac{b^2}{\sin^2\alpha} = \frac{(a^2+b^2)^2}{P^2}$

   (D) $\frac{a^2}{\cos^2\alpha} + \frac{b^2}{\sin^2\alpha} = \frac{(a^2-b^2)^2}{P^2}$

Sol. $\frac{a^2}{\cos^2\alpha} + \frac{b^2}{\sin^2\alpha} = \frac{(a^2-b^2)^2}{P^2}$. **Ans.(D)**

14. The equation of the ellipse whose latus rectum is 5 and whose eccentricity is 2/3 the axes of the ellipse being the axes of coordinates is

   (A) $\frac{x^2}{4} + \frac{y^2}{5} = 20$

   (B) $\frac{x^2}{5} + \frac{y^2}{4} = 1$

   (C) $\frac{4x^2}{81} + \frac{4y^2}{45} = 1$

   (D) None of these

Sol. $\frac{4x^2}{81} + \frac{4y^2}{45} = 1$. **Ans.(C)**

15. The eccentricity of the hyperbola $x^2/a^2 - y^2/b^2 = 1$ is given by
   (A) $a^2(e^2 - 1) = b^2$
   (B) $b^2(e^2 - 1) = a^2$
   (C) $a^2(e^2 + 1) = b^2$
   (D) $b^2(e^2 + 1) = a^2$

Sol. **Ans.(A)**

16. The straight line lx + my + n = 0, touches the hyperbola $x^2/a^2 - y^2/b^2 = 1$, if
   (A) $a^2c^2 + b^2a^2 = b^2$
   (B) $al + bm = n$
   (C) $a^2l^2 + b^2m^2 = n$
   (D) $a^2l^2 - b^2m^2 = n^2$

Sol. $\Rightarrow c^2 = a^2m^2 - b^2 \Rightarrow \left(-\frac{n}{m}\right)^2 = a^2\left(-\frac{l}{m}\right)^2 - b^2$

$\Rightarrow n^2 = a^2l^2 - b^2m^2$. **Ans.(D)**

17. The equation of hyperbola, whose focus is (1, 2), directrix is $2x + y = 1$ and eccentricity $\sqrt{3}$ is

(A) $7x^2 - 12xy + 2y^2 - 2x + 14y - 22 = 0$

(B) $7x^2 - 12xy + 2y^2 - 2x + 14y + 22 = 0$

(C) $7x^2 - 12xy + 2y^2 - 2x - 14y - 22 = 0$

(D) $7x^2 + 12xy + 2y^2 - 2x + 14y - 22 = 0$

Sol. Equation of the hyperbola is $7x^2 + 2y^2 + 2x - 14y - 12xy + 22 = 0$. **Ans.(D)**

A very simple question, verbatim questions are present in Assignment's of PT, PT student should have taken less than 1 minute to solve it.

18. The equation of hyperbola whose asymptotes are $y = \pm 2x$ and vertices are $(\pm 6, 0)$ is

(A) $2x^2 - y^2 = 72$

(B) $4x^2 - y^2 = 144$

(C) $3x^2 - y^2 = 108$

(D) None of these

Sol. Check from options. **Ans.(B)**

19. Which statement is false for the $(x^2/a^2 - y^2/b^2) = 1$ hyperbola?

(A) A hyperbola and its conjugate have the same asymptoties.

(B) If a pair of conjugate diameters cuts two conjugate hyperbolas diameters cuts to conjugate hyperbolas in p and d.

(C) The equation of tangent at a point θ is $x/a \times \sec\theta + y/b \times \tan\theta = 1$.

(D) The equation of hyperbola referred to its asymptotes as axes is rectangular hyperbola $xy = c^2$.

Sol. **Ans.(C)**

20. If $y = \tan^{-1}\frac{2x}{1-x^2}$ then dy/dx is

(A) $\frac{1}{1+x^2}$

(B) $\frac{-1}{1+x^2}$

(C) $\frac{-2}{1+x^2}$

(D) $\frac{2}{1+x^2}$

Sol. $y = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$ put $x = \tan\theta$

$\Rightarrow y = \tan^{-1}\left(\frac{2\tan\theta}{\cos^2\theta - \sin^2\theta}.\cos^2\theta\right) \Rightarrow y = \tan^{-1}(\tan 2\theta) \Rightarrow y = 2\theta$

$\Rightarrow \frac{dy}{dx} = \frac{2}{1+x^2}$. **Ans.(D)**

21. If $y = \frac{\log[(x^{3-1})^{1/3}x^{2/3}]}{ax+b}$ then dy/dx is

(A) a/ax + b

(B) 1/ax – b

(C) 1/ax + b

(D) None of these

Sol. **Ans.(D)**

22. If y = x(3 – x) then the value of x when dy/dx = 0 is
(A) –3/2
(B) 3/2
(C) 1/2
(D) –1/2

Sol. y = x (3 – x)

$\Rightarrow \frac{dy}{dx} = 3 - 2x = 0 \Rightarrow x = 3/2$. **Ans.(B)**

23. The curve y = x + 1/x, the points at which the tangents to the curve are parallel to x axis are
(A) (1, 2); (–1, –2)
(B) (1, 2); (–1, 2)
(C) (1, 2); (1, –2)
(D) None of these

Sol. $y = x + \frac{1}{x} \Rightarrow \frac{dy}{dx} = 1 - \frac{1}{x^2} = 0$

$\Rightarrow x = \pm 1$, y = 2 and 0. **Ans.(D)**

24. $y = \sin^{-1}x$ then dy/dx is

(A) $\frac{1}{\sqrt{1+x^2}}$

(B) $\frac{-1}{\sqrt{1+x^2}}$

(C) $\frac{1}{\sqrt{1-x^2}}$

(D) $\frac{-1}{\sqrt{1-x^2}}$

Sol. $y = \sin^{-1}x$

$\Rightarrow \frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$. **Ans.(C)**

Standard Result

25. If $f(x, y) = x^4 + x^2y^2 + y^4$ then
(A) 2xy
(B) xy
(C) 4xy
(D) None of these

Sol. $f(x, y) = x^4 + x^2y^2 + y^4$

$\Rightarrow \frac{\partial f}{\partial x} = 4x^3 + 2xy^2 \Rightarrow \frac{\partial^2 f}{\partial y \partial x} = 4xy$. **Ans.(C)**

26. For the maximum value of $f(x) = (x - 1)(x - 2)(x - 3)$ we have x equal to
   (A) $2 + 1/\sqrt{2}$
   (B) $2 - 1/\sqrt{2}$
   (C) $-\frac{2}{3\sqrt{3}}$
   (D) $\frac{2}{3\sqrt{3}}$

Sol. $f(x) = (x - 1)(x - 2)(x - 3)$

$\Rightarrow f(x) = (x^2 - 3x + 2)(x - 3) \Rightarrow f(x) = x^3 - 3x^2 + 2x - 3x^2 + 9x - 6$

$\Rightarrow f(x) = x^3 - 6x^2 + 11x - 6 \Rightarrow f'(x) = 3x^2 - 12x + 11$

$\Rightarrow$ for maxima or minima $f'(x) = 0$

$\Rightarrow x = \frac{12 \pm \sqrt{144 - 4 \times 3 \times 1}}{6} \Rightarrow x = \frac{12 \pm \sqrt{12}}{6} \Rightarrow x = 2 \pm \frac{1}{\sqrt{3}}$

$\Rightarrow f''(x) = 6x - 12 \Rightarrow f''(x) < 0$ at $2 - \frac{1}{\sqrt{3}}$

So maximum value of f(x) is

$f(x) = (2 - \frac{1}{\sqrt{3}} - 1)(2 - \frac{1}{\sqrt{3}} - 2)(2 - \frac{1}{\sqrt{3}} - 3)$

$f(x) = \left(1 - \frac{1}{\sqrt{3}}\right)\left(\frac{1}{\sqrt{3}}\right)\left(1 + \frac{1}{\sqrt{3}}\right) \Rightarrow f(x) = 1 - \frac{1}{3} \times \frac{1}{\sqrt{3}} = \frac{2}{3\sqrt{3}}$. **Ans.(D)**

Lots of similar questions were solved in PT's class room.

27. The minomial gradient dy/dx of the curve is
   (A) 1
   (B) −1
   (C) 2
   (D) None of these

Sol. **Ans.(D)**

28. Dividing 20 into two parts such that $x + y = 20$, $z = y^2x^3$ the maximum value of z is at x equal to
   (A) 10
   (B) 11
   (C) 12
   (D) None of these

Sol. $z = y^2x^3$

$\Rightarrow z = x^3 . (20 - x)^2\ z = x^3 (x^2 - 40x + 400)$

$\Rightarrow z = x^5 - 40x^4 + 400x^3 \Rightarrow \frac{dz}{dx} = 5x^4 - 160x^3 + 1200x^2$

$\Rightarrow$ for max or min of z, $\frac{dz}{dx} = 0$

$\Rightarrow 5x^2 - 160x + 1200 = 0 \Rightarrow x^2 - 32x + 240 = 0$

$\Rightarrow x^2 - 32x + 240 = 0 \Rightarrow x(x - 20) - 12(x - 20) \Rightarrow x = 12, 20$. **Ans.(B)**

29. If u = f(y/x) then $u(y_2 + y_4 + ... + y_{2n})$

(A)

(B)

(C)

(D)

Sol. In sufficient data.

30. $\int \frac{x^4+1}{x^2}dx =$

(A) $x^{2/3} + 1/x + c$

(B) $x^3/6 - 1/x + c$

(C) $\frac{x^3}{3} - \frac{1}{x} + c$

(D) None of these

Sol. $\int \frac{x^4+1}{x^2}dx \Rightarrow \int \left(x^2 + \frac{1}{x^2}\right)dx \Rightarrow \frac{x^3}{3} - \frac{1}{x} + c$. **Ans.(C)**

31. $\int_1^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)dx$ is

(A) 25/4

(B) 13/2

(C) 19/3

(D) None of these

Sol. $\int_1^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)dx \Rightarrow \left(\frac{2}{3}x^{3/2} - 2\sqrt{x}\right)_1^4 \Rightarrow \left(\frac{2}{3}\times 8 - 4\right) - \left(\frac{2}{3} - 2\right) \Rightarrow \frac{4}{3} + \frac{4}{3} = \frac{8}{3}$. **Ans.(D)**

32. The area bounded by the curve $y = 4 + 3x - x^2$ and x-axis in square units is

(A) 12/7

(B) 124/7

(C) 125/6

(D) None of these

Sol. $y = 4 + 3x - x^2 \Rightarrow x^2 - 3x - 4 = 0 \Rightarrow x^2 - 4x + x - 4 = 0$

$\Rightarrow x(x-4) + 1(x-4) \Rightarrow x = 4 - 1$

$\Rightarrow \int_{-1}^{4} y\,dx = \int_{-1}^{4} \left(4 + 3x - x^2\right)dx$

$= = \left(4x + \frac{3x^2}{2} - \frac{x^3}{3}\right)_{-1}^{4} = \frac{55}{6}$ sq unit. **Ans.(D)**

33. The part of parabola $y^2 = 4ax$, cut off by the latus rectum revolves about the tangent at the vertex. The volume generated by the reel is

(A) $\frac{2\pi a^3}{5}$

(B) $\frac{4\pi a^3}{5}$

(C) $\frac{8\pi a^3}{5}$

(D) $\frac{16\pi a^3}{5}$

Sol. **Ans.(B)**

Standard Result

34. The surface of the solid generated by the reduction of $x = a\cos^3 t$, $y = a\sin^3 t$, about x axis is

(A) $11/5\pi a^2$

(B) $\frac{12\pi a^2}{5}$

(C) $\frac{6\pi a^2}{5}$

(D) None of these

Sol. **Ans.(B)**

35. The area of a loop of the curve of sin 3a is

(A)

(B)

(C)

(D)

Sol. Insufficient data.

36. $\int \frac{xe^x dx}{(x+1)^2}$ is

(A) $e^x/(1 + x)$

(B) $e^x/(1 - x)$

(C) $e^{-x}/(1 + x)$

(D) $e^{-x}/(1 - x)$

Sol. $\int \frac{(x+1-1)e^x}{(1+x)^2} dx = \int \frac{e^x}{(1+x)} dx - \int \frac{e^x}{(1+x)^2} dx = \frac{e^x}{1+x}$. **Ans.(A)**

An easy question, a good student should have answered this no time.

37. Which statement is correct by Simpson's rule value of $\int_a^b y\,dx$ where h = $\frac{b-a}{2r}$, y_r is the value for y corresponding to the value of a + (r – 1)h of

(A) $\frac{h}{3}[y_0 + y_r + 2(y_2 + y_4 + y_6 + \ldots) + 4(y_1 + y_3 + y_5 + \ldots)]$

(B) $\frac{h}{2}[y_0 + y_r + 2(y_2 + y_4 + y_6 + \ldots) + 4(y_1 + y_3 + y_5 + \ldots)]$

(C) $\frac{2}{h}[y_0 + y_r + 2(y_2 + y_4 + y_6 + \ldots) + 4(y_1 + y_3 + y_5 + \ldots)]$

(D) None of these

Sol. **Ans.(A)**

38. Solution of (x – y – 2)dx – (2x – 2y – 3) dy = 0 is

(A) log(x – y – 1) = x + y + c
(B) log (x – y – 1) = x – y + cy
(C) 3 log (x – y – 1) = x – 2y – c
(D) None of these

Sol. $\frac{dy}{dx} = \frac{x-y-2}{2x-2y-3}$. Put x – y = v $\Rightarrow \int\left(\frac{2v-3}{v-1}\right)dv = \int dx$. **Ans.(D)**

39. $\int \frac{dx}{x(x^4-1)}$ is

(A) $\frac{1}{4}\log\left(\frac{x^4-1}{x^4}\right) + C$

(B) $\frac{1}{4}\log\left(\frac{x^4+1}{x^4}\right) + C$

(C) $\log\left(\frac{x^4+1}{x^4}\right) + C$

(D) None of these

Sol. $\int \frac{dx}{x(x^4-1)}$. Put $1 - \frac{1}{x^4} = y$

$\Rightarrow \frac{1}{4}\int \frac{dy}{y} = \frac{1}{4}\log\left(\frac{x^4-1}{x^4}\right) + C$. **Ans.(A)**

40. Solution of $(x + 2y^3)dy/dx = y$ is

(A) $x = y^3 + cy$
(B) $x = y^3 - cy$
(C) $y = y^3 + cx$
(D) $y = x^3 + cy$

Sol. $(x + 2y^3)\frac{dy}{dx} = y$

$\Rightarrow \frac{dx}{dy} - \frac{x}{y} = 2y^2 \Rightarrow \text{I.F.} = \frac{1}{y}$

$\Rightarrow \frac{x}{y} = \int 2y^2.\frac{1}{y}.dy + c \Rightarrow \frac{x}{y} = y^2 + c \Rightarrow x = y^3 + cy$. **Ans. (A)**

41. Solution of $(x^2 - yx^2)dy + (y^2 - xy^2)dx = 0$ is

(A) $\log x - \log y = -\left(\frac{1}{x}+\frac{1}{y}\right)+c$

(B) $\log x + \log y = \left(\frac{1}{x}+\frac{1}{y}\right)+c$

(C) $\log x + \log y = -\left(\frac{1}{x}-\frac{1}{y}\right)+c$

(D) $\log x + \log y = -\left(\frac{1}{x}+\frac{1}{y}\right)+c$

Sol. $\frac{1-y}{y^2}.dy = \frac{x-1}{x^2}.dx$

$\Rightarrow \int\left(\frac{1}{y^2}-\frac{1}{y}\right)dy = \int\left(\frac{1}{x}-\frac{1}{x^2}\right)dx$

$\Rightarrow -\frac{1}{y} - \log y = \log x + \frac{1}{x}$

$\Rightarrow \log x + \log y = -\left(\frac{1}{x}+\frac{1}{y}\right)+c$. **Ans.(D)**

42. Solution of $(x + 2y^3)\, dy/dx = y$ is

(A) $x = y^3 + cy$

(B) $x = y^3 - cy$

(C) $y = y^3 + cx$

(D) $y = x^3 + cy$

Sol. $(x+ 2y^3)\ \frac{dy}{dx} = y$

$\Rightarrow \frac{dx}{dy} - \frac{x}{y} = 2y^2 \ \Rightarrow$ I.F. $\frac{1}{y}$

$\Rightarrow \frac{x}{y} = \int 2y^2.\frac{1}{y}.dy + c$

$\Rightarrow \frac{x}{y} = y^2 + c \Rightarrow x = y^3 + cy$. **Ans. (A)**

43. Solution of $x(x - y)dy + y^2dx = 0$ is

(A) $y = ce^{-y/x}$

(B) $y = c.e^{y/x}$

(C) $x = c.e^{y/x}$

(D) $x = c.e^{x/y}$

Sol. $x(x - y)\,dy + y^2\,dx = 0$

$\Rightarrow \frac{x^2 - xy}{y^2} = -\frac{dx}{dy}$

$\Rightarrow \left(\frac{x}{y}\right)^2 - \frac{x}{y} = \frac{-dx}{dy}$

$\Rightarrow \frac{dx}{dy} = \frac{x}{y} - \left(\frac{x}{y}\right)^2$ put $\frac{x}{y} = z$

$\Rightarrow \frac{dx}{dy} = z + y.\frac{dz}{dy}$

$\Rightarrow z + y \cdot \frac{dz}{dy} = z - z^2$

$\Rightarrow y \cdot \frac{dz}{dy} = -z^2$

$\Rightarrow \frac{1}{z} = \log y + \log c$

$\Rightarrow y = c.e^{y/x}$. **Ans.(B)**

44. The different equation $p^3 - (x^2 + xy + y^2)\, p^2 + (x^3y + x^2 y^2 + x^3y^3)\, py - x^3y^3 = 0$ is of $\left(p = \frac{dy}{dx}\right)$

(A) third order and first degree
(B) first order and first degree
(C) first order and third degree
(D) None of these

Sol. **Ans.(A)**
Standard Result

45. The differential equation of the circle $(x - a)^2 + (y - b)^2 = c$ is

(A) $\frac{dy}{dx} = \frac{x-a}{y-b}$

(B) $\frac{dy}{dx} = -\frac{x-a}{y-b}$

(C) (x – a) dy + (y – b) dx = 0
(D) None of these

Sol. **Ans.(B)**

46. Solutions of $\frac{dy}{dx} + 2y\tan x = \sin x$ with the given condition y = 0, x = π / 3 is

(A) $y = \cos x - 2\sin^2 x$
(B) $y = \sin x - 2\cos^2 x$
(C) $y = \sin x - 2\sin^2 x$
(D) $y = \cos x - 2\cos^2 x$

Sol. **Ans.(D)**
A very simple question, verbatim questions are present in Assignment's of PT, PT student should have taken less than 1 minute to solve it.

47. The order of the difference equation yn + 3 – 2yn + 1 + 2 yn is
(A) 1
(B) 2
(C) 3
(D) 4

Sol. The order of the differential equation is defined as the order of the highest derivative which occurs. **Ans.(C)**

48. The difference equation obtained by eliminating the constants C_1 and C_2 from the equation $Y_n = C_1 (41)^n + C_2 (3)^n$ is

(A) $y_{n+2} + y_{n+1} + 24y_n = 0$

(B) $y_{n+2} - 24y_{n+1} + y_n = 0$

(C) $y_{n+2} + 24y_{n+1} + y_n = 0$

(D) None of these

Sol. ***Lots of similar questions were solved in PT's class room.*** **Ans.(D)**

49. The solutions of the difference equation $y_{n+3} - 5y_{n+2} + 8y_{n+1} - 4y_n = 0$

(A) $y_n = c_1(-1)^n + c_2 (-2)^n + c_3 (2)^n$

(B) $y_n = c_1(-1)^n + c_2 (1)^n + c_3 (2)^n$

(C) $y_n = c_1(1)^n + c_2 (-2)^n + c_3 (2)^n$

(D) $y_n = c_1(1)^n + (c_2 + nc_3) + (2)^n$

Sol. $y_{n+3} - 5y_{n+2} + 8y_{n+1} - 4y_n = 0$

The auxiliary equation corresponding to the given equation is

$E^3 - 5E^2 + 8E - 4 = 0$ or $m^3 - 5m^2 + 8m - 4 = 0$ or $m = 2, 2, 1$

$y_n = c_1(1)^n + (c_2 + nc_3) + (2)^n$. **Ans.(D)**

50. The three consecutive odd numbers where sum is 141 are

(A) 45, 47, 49

(B) 41, 43, 45

(C) 39, 41, 43

(D) None of these

Sol. **Ans.(A)**

51. A lawn 30 m long and 16 m wide is surrounded by path 2 m wide. The area of the path is

(A) 170 sq m

(B) 180 sq m

(C) 190 sq m

(D) 200 sq m

Sol. Area = $(34 \times 20 - 30 \times 16) = 200$ sqm. **Ans.(D)**

52. The square root of $\frac{x^2}{9} - \frac{xy}{6} + \frac{y^2}{16}$ is

(A) $\frac{4}{8}x - \frac{y}{3}$

(B) $\frac{4}{3}x - \frac{y}{4}$

(C) $\frac{x}{3} - \frac{y}{4}$

(D) None of these

Sol. $\sqrt{\frac{x^2}{9} - \frac{xy}{6} + \frac{y^2}{16}} = \frac{x}{3} - \frac{y}{4}$. **Ans.(C)**

53. The number to be added to each term of the ratio 7 : 13 to make it equal to 3 : 4 is

(A) 11

(B) 12

(C) 13

(D) 14

Sol. $\frac{7+a}{13+a} = \frac{3}{4} \Rightarrow a = 11$. **Ans.(A)**

54. Solutions of

$x(x + y + z) = 18$

$y(y + z + x) = 27$

$z(z + x + y) = 39$ isi.e., or positive (x, y, z) equal to

(A) (1, 2, 3)

(B) (4, 3, 2)

(C) (2, 4, 3)

(D) (2, 3, 4)

Sol. $x : y : z = 18 : 27 : 36 \Rightarrow (x, y, z) = (2, 3, 4)$. **Ans.(D)**

55. Which statement is false?

(A) $e < 3$

(B) $\log_e \frac{1+x}{1-x} = 2(1 + x + \frac{1}{3}x^3 + \frac{1}{5}x^5 + \ldots)$

(C) $\frac{e^x + e^{-x}}{2} = 1 + \frac{x^2}{2} + \frac{x^4}{4} + \ldots$

(D) ${}^{30}C_{28} = {}^{30}C_2$

Sol. **Ans.(B)**

56. Solving $x^{2/3} + x^{1/3} - 2 = 0$ we have for x

(A) (1, – 8)

(B) (8, –8)

(C) (1, – 27)

(D) (1, –1)

Sol. Put $x^{1/3} = y \Rightarrow y^2 + y - 2 = 0 \Rightarrow y^2 + 2y - y - 2 = 0$

$\Rightarrow y = -2, 1 \Rightarrow x = -8, 1$. **Ans.(A)**

57. Value of $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$

(A) $a^2 + b^2 + c$

(B) $a + b + c$

(C) $abc(a + b + c)$

(D) 0

Sol. $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = \begin{vmatrix} 1 & a & 1 \\ 1 & b & 1 \\ 1 & c & 1 \end{vmatrix} (a + b + c) = 0$. **Ans.(D)**

58. If determinant $|A| = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_3 \\ a_3 & b_3 & c_3 \end{vmatrix}$, then

(A) $a_1A_1 + b_1B_1 + c_1C_1 = 0$

(B) $a_1A_1 + b_1B_1 + c_1C_1 = |A|$

(C) $a_1A_2 + b_1B_2 + c_1C_2 = |A|$

(D) $c_1B_1 + c_2B_2 + c_3B_3 = |A|$

Sol. **Ans.(B)**

59. If $\Delta = \begin{vmatrix} 0 & c & b \\ c & 0 & a \\ b & a & c \end{vmatrix}$, then the determinant of the cofactors.

(A) $\begin{vmatrix} a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & c^2 \end{vmatrix}$

(B) $\begin{vmatrix} a^2 & ab & ac \\ ab & b^2 & bc \\ ac & bc & c^2 \end{vmatrix}$

(C) $\begin{vmatrix} a^2 & ab & ac \\ ac & bc & c^2 \\ ab & -b^2 & bc \end{vmatrix}$

(D) $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & ac \\ ac & bc & c^2 \end{vmatrix}$

Sol. $\Delta = \begin{vmatrix} 0 & c & b \\ c & 0 & a \\ b & a & 0 \end{vmatrix}$. **Ans.(D)**

60. In the matrix A = $\begin{vmatrix} 8 & 4 & 2 \\ 2 & 8 & 4 \\ 1 & 2 & 8 \end{vmatrix}$ the cofactor A_{22} is

(A) 62
(B) 63
(C) 64
(D) 63

Sol. A = $\begin{bmatrix} 8 & 4 & 2 \\ 2 & 8 & 4 \\ 1 & 2 & 8 \end{bmatrix} \Rightarrow A_{22} = 62$. **Ans.(A)**

61. $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}^{-1}$ is given by

(A) $\begin{bmatrix} 1 & -3 & 2 \\ 3 & 3 & 1 \\ 2 & 1 & 3 \end{bmatrix}$

(B) $\begin{bmatrix} 1 & -3 & 2 \\ 3 & 3 & -1 \\ 2 & -1 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & -3 & 2 \\ -3 & -3 & 1 \\ 2 & 1 & 3 \end{bmatrix}$

(D) $\begin{bmatrix} -1 & -3 & 2 \\ -3 & -3 & 1 \\ 2 & 1 & 3 \end{bmatrix}$

Sol. Let A = $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix} \Rightarrow A^{-1} = \frac{\text{adj}A}{|A|}$. **Ans.(B)**

62. If A = $\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$, then A^3 is equal to

(A) 2 A
(B) 3 A
(C) 4 A
(D) None of these

Sol. A = $\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \Rightarrow A^2 = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$

$\Rightarrow A^3 = A^2 - A = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} = \begin{bmatrix} 4 & -4 \\ -4 & 4 \end{bmatrix}$ = 4A. **Ans.(C)**

63. If $A = \begin{bmatrix} 2 & 3 & 1 \\ 0 & -1 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}$, then

(A) $\begin{bmatrix} 1 & 0 & 5 \\ 1 & 1 & 1 \end{bmatrix}$

(B) $\begin{bmatrix} 0 & 1 & 5 \\ 1 & 0 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 0 & 1 & -5 \\ 1 & 0 & 0 \end{bmatrix}$

(D) $\begin{bmatrix} 1 & 0 & 5 \\ 0 & 1 & 1 \end{bmatrix}$

Sol. Insufficient data.

Overall Analysis

Overall the test was of average to medium level difficulty, an overall score of around 52 - 55+ should be good enough to get a call from this institute.