EAMCET MODEL PAPER

ENGINEERING

No. of Questions: 160 **Maximum Marks: 160** **Time: 3 hours**

MATHEMATICS

1. If $y = f(x) = \frac{2x-1}{x-k}$, then $f(y) = x$ gives k =

1) 2 2) –2 3) 1 4) –1

2. The real functions f and g are given by $f(x) = x - [x]$, $g(x) = \cos[x]$, where [x] denotes the integral part of x then the range of gof is

1) [–1, 1] 2) { –1, 1} 3) { –1} 4) { 1}

3. If $10^n + 3.4^n + k$ is divisible by 9 for all $n \in N$, then the least value of k is

1) 1 2) 5 3) 14 4) 23

4. The most general value of θ which satisfies both the equation $\sin\theta = -\frac{1}{2}$ and $\tan\theta = \frac{1}{\sqrt{3}}$, is

1) $2n\Pi + \frac{\Pi}{6}, n \in Z$ 2) $2n\Pi + \frac{7\Pi}{6}, n \in Z$

3) $2n\Pi + \frac{11\Pi}{6}, n \in Z$ 4) $2n\Pi \pm \frac{\Pi}{6}$

5. The value of $\sin^{-1}\left(\frac{-\sqrt{3}}{2}\right) + 2\cos^{-1}\left(-\frac{1}{2}\right)$ is equal to

1) 2Π 2) Π 3) $\frac{\Pi}{2}$ 4) $\frac{3\Pi}{2}$

6. If the diagonals of a parallelogram are given by $3\bar{i} + \bar{j} - 2\bar{k}$ and $\bar{i} - 3\bar{j} + 4\bar{k}$, then the lengths of its sides are

1) $\sqrt{8}, \sqrt{10}$ 2) $\sqrt{6}, \sqrt{14}$ 3) $\sqrt{5}, \sqrt{12}$ 4) $\sqrt{6}, \sqrt{12}$

7. A unit vector perpendicular to the plane of $\bar{a} = 2\bar{i} - 6\bar{j} - 3\bar{k}$, $\bar{b} = 4\bar{i} + 3\bar{j} - \bar{k}$ is

1) $\frac{4\bar{i} + 3\bar{j} - \bar{k}}{\sqrt{26}}$ 2) $\frac{2\bar{i} - 6\bar{j} - 3\bar{k}}{7}$

3) $\frac{3\bar{i} - 2\bar{j} + 6\bar{k}}{7}$ 4) $\frac{2\bar{i} - 3\bar{j} - 6\bar{k}}{7}$

8. $\bar{a}$ is a perpendicular to $\bar{b}, \bar{c}$. If $|\bar{a}| = 2, |\bar{b}| = 3, |\bar{c}| = 4, (\bar{b}, \bar{c}) = \frac{2\Pi}{3}$ then $|[\bar{a}\ \bar{b}\ \bar{c}]| =$

1) $12\sqrt{3}$ 2) 12 3) $6\sqrt{3}$ 4) 6

9. If $\bar{a}$ and $\bar{b}$ are vectors, satisfying $|\bar{a}| = |\bar{b}| = 5$ and $(\bar{a}, \bar{b}) = 45°$, then the area of the triangle constructed with the vectors $\bar{a} - 2\bar{b}$ and $3\bar{a} + 2\bar{b}$ is

1) $50\sqrt{2}$ sq.unit 2) $5\sqrt{5}$ sq.unit 3) $4\sqrt{5}$ sq.unit 4) $3\sqrt{5}$ sq.unit

10. If d.r's of the two lines are 2, 1, –2 and 3, –2, 6 then the d.r's of the line bisecting the angle between the lines are

1) 23, –1, 4 2) 23, 1, –4 3) 23, –1, –4 4) 23, 1, 4

11. $f(x) = \dfrac{\log\left(1 + \frac{x}{a}\right) - \log\left(1 - \frac{x}{b}\right)}{x}$ is continuous at x = 0 then f(0) =

1) $\dfrac{a - b}{ab}$ 2) $\dfrac{a + b}{ab}$ 3) $\dfrac{ab}{a + b}$ 4) $\dfrac{ab}{a - b}$

12. If $\bar{a} = (-4, 2, 4)$ and $b = \left(\sqrt{2}, -\sqrt{2}, 0\right)$ then $\left(2\bar{a}, \dfrac{\bar{b}}{2}\right)$ =

1) 45° 2) 135° 3) 90° 4) 0°

13. If $\dfrac{\tan 3A}{\tan A} = p$, then the ratio of $\dfrac{\sin 3A}{\sin A}$ & $\dfrac{\cos 3A}{\cos A}$ =

1) p – 1: p + 1 2) p : 2 3) p + 1: p – 1 4) p :1

14. The range of $\cos^2 x + 4\cos x + 5$ lies in

1) [10, 15] 2) [–5, 10] 3) [2, 10] 4) [–2, 10]

15. If sin x.cos h y = cos θ , cos x sin h y = sin θ then $\sin h^2 y$ =

1) $\cos h^2 x$ 2) cos h x 3) $\sin h^2 x$ 4) $\cos^2 x$

16. In a triangle ABC, if 5 cos C + 6 cos B = 4 & 6 cos A + 4 cos C = 5 then $\tan\frac{C}{2}.\tan\frac{A}{2}$ =

1) $\dfrac{3}{5}$ 2) $\dfrac{1}{3}$ 3) $\dfrac{1}{5}$ 4) $\dfrac{4}{5}$

17. A 20 mt long tree is broken by wind and the top struck the ground at an angle of 30°. The height of the point where the tree broken is

1) $\dfrac{10}{3}$ mt 2) $\dfrac{20}{3}$ mt 3) $\dfrac{16}{3}$ mt 4) 7 mt

18. If base angles of a triangle are $22\frac{1}{2}^\circ$, $112\frac{1}{2}^\circ$ then base and height are in the ratio

1) 1 : 2 2) 1 : 3 3) 3 : 1 4) 2 : 1

19. $\bar{i} \times [(\bar{a} \times \bar{b}) \times \bar{i}] + \bar{j} \times [(\bar{a} \times \bar{b}) \times \bar{j}] + \bar{k} \times [(\bar{a} \times \bar{b}) \times \bar{k}]$ =

1) $(\bar{a} \times \bar{b})$ 2) $2(\bar{a} \times \bar{b})$ 3) $3(\bar{a} \times \bar{b})$ 4) 0

20. $\lim\limits_{x \to 1/2} \left(\dfrac{8x - 3}{2x - 1} - \dfrac{4x^2 + 1}{4x^2 - 1}\right)$ =

1) 9 2) $\dfrac{2}{7}$ 3) $\dfrac{7}{2}$ 4) –13

21. If f : R → R is defined by $f(x) = \begin{cases} \dfrac{2\sin x - \sin 2x}{2x\cos x} & \text{if } x \neq 0 \\ \alpha & \text{for } x = 0 \end{cases}$

then the value of α so that f is continuous at 0 is

1) 2 2) 1 3) –1 4) 0

22. If y_k is the k^{th} derivative of y w.r.t x, $y = \cos(\sin x)$, then $y_1 \sin x + y_2 \cos x =$

1) $y \sin^3 x$ 2) $-y \sin^3 x$ 3) $y \cos^3 x$ 4) $-y \cos^3 x$

23. If $x \sin y = 3\sin y + 4\cos y$ then $\frac{dy}{dx} =$

1) $\frac{\sin^2 y}{4}$ 2) $\frac{\cos^2 y}{4}$ 3) $\frac{-\sin^2 y}{4}$ 4) $\frac{-\cos^2 y}{4}$

24. The focal length of a mirror is given by $\frac{1}{v} - \frac{1}{u} = \frac{2}{f}$. If equal errors α are made in measuring u and v then relative error in f is

1) $\frac{2}{\alpha}$ 2) $\alpha\left(\frac{1}{u} - \frac{1}{v}\right)$ 3) $\alpha\left(\frac{1}{u} + \frac{1}{v}\right)$ 4) $\frac{3}{\alpha}$

25. The condition that the two curves $y^2 = 4ax$, $xy = c^2$ cut orthogonally is

1) $c^2 = 16a^2$ 2) $c^4 = 32a^4$ 3) $c^4 = 16a^4$ 4) $c^2 = 32a^2$

26. Normal form of the line $x - y + \sqrt{2} = 0$ is

1) $x \cos\frac{\pi}{4} + y \sin\frac{\pi}{4} = 1$ 2) $x \cos\frac{3\pi}{4} + y \sin\frac{3\pi}{4} = 1$

3) $x \cos\frac{5\pi}{4} + y \sin\frac{5\pi}{4} = 1$ 4) $x \cos\frac{7\pi}{4} + y \sin\frac{7\pi}{4} = 1$

27. A line makes the same angle θ, with each of the x and z axis. If the angle β, which it makes with y-axis, is such that $\sin 2\beta = 3 \sin 2\theta$ then $\sin 2\theta =$

1) $\frac{2}{3}$ 2) $\frac{1}{5}$ 3) $\frac{3}{5}$ 4) $\frac{2}{5}$

28. If (2, –3, 6) is the foot of the perpendicular drawn from the origin to a plane then the equation of the plane is

1) $2x + 4y - 3z - 29 = 0$ 2) $2x - 5y + 8z + 98 = 0$

3) $2x + 4y + 3z + 29 = 0$ 4) $2x - 3y + 6z - 49 = 0$

29. A straight rod of length 9 unit, slides with its ends A, B always on the x and y axes respectively. Then the locus of the centroid of ΔABC is

1) $x^2 + y^2 = 3$ 2) $x^2 + y^2 = 9$ 3) $x^2 + y^2 = 1$ 4) $x^2 + y^2 = 81$

30. The origin shifted to (1, 2) then the equation $y^2 - 8x - 4y + 12 = 0$ changes as $Y^2 = aX$ then a =

1) 2 2) 8 3) –2 4) –8

31. If $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$ then $\cos\theta + \sin\theta =$

1) $\sqrt{2}\cos\theta$ 2) $\sqrt{2}\sin\theta$ 3) $2\cos\theta$ 4) $2\sin\theta$

32. If $A = \begin{bmatrix} 0 & a+1 & b-2 \\ 2a-1 & 0 & c-2 \\ 2b+1 & 2+c & 0 \end{bmatrix}$ is skew symmetric then $a + b + c =$

1) 3 2) – 3 3) $\frac{7}{3}$ 4) $\frac{1}{3}$

33. If A is 3 × 3 matrix and det (*adj A*) = k then det (adj(2A)) =

1) 2 k 2) 8 k 3) 16 k 4) 64 k

34. If $3A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ then $A - 1 =$

1) A^T 2) $2A^T$ 3) $3A^T$ 4) A^3

35. The constant c of Rolle's theorem for the function $f(x) = 2x^3 + x^2 - 4x - 2$ in $\left[-\sqrt{2}, \sqrt{2}\right]$ is

1) 0 2) 1 3) $\frac{1}{2}$ 4) $\frac{2}{3}$

36. The function $\frac{\log x}{x}$ is increasing in

1) (1, 2e) 2) (0, e) 3) (2, 2e) 4) (1/e, 2e)

37. Two pairs of straight lines $y^2 + xy - 12x^2 = 0$, and $ax^2 + 2hxy + by^2 = 0$ have one line in common then

1) $a + 8h - 16b = 0$ 2) $a - 8h + 16b = 0$

3) $a - 6h + 9b = 0$ 4) $a - 6h + 6b = 0$

38. If the pair of lines $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ intersect on the x-axis, then $2fgh =$

1) $af^2 + ch^2$ 2) $bg^2 + ch^2$ 3) $af^2 + bg^2$ 4) $af^2 + g^2$

39. The vertex of an equilateral triangle is at (2, –1) and the side opposite to it has equation $x + y = 2$ then orthocenter of the triangle is

1) $\left(\frac{1}{3}, \frac{1}{3}\right)$ 2) $\left(\frac{\sqrt{2}}{3}, \frac{\sqrt{2}}{3}\right)$ 3) $\left(\frac{7}{3}, \frac{-2}{3}\right)$ 4) (1, 1)

40. The distance of the point (2, 3) from the line $2x - 3y + 9 = 0$ measured along a line making an angle 45° with x-axis is

1) $4\sqrt{2}$ 2) 4 3) $\frac{4}{\sqrt{2}}$ 4) 2

41. α, β are the roots of $x^2 + x + 1 = 0$ then equation whose roots are α^{19}, β^{16}

1) $x^2 - x - 1 = 0$ 2) $x^2 - x + 1 = 0$ 3) $x^2 + x - 1 = 0$ 4) $x^2 + x + 1 = 0$

42. If the equations $x^2 - cx + d = 0$, $x^2 - ax + b = 0$ have one common root and second equation has equal roots then $2(b + d) =$

1) $a + c$ 2) $a - c$ 3) ac 4) $3ac$

43. If 2, 3 be the roots of $2x^3 + mx^2 - 13x + n = 0$, then the values of m and n are respectively

1) –5, –30 2) –5, 30 3) 5, 30 4) 5, –30

44. If the equation $2x^3 - 9x^2 + 12x + k = 0$ has two equal roots then $k =$

1) 5 2) –5 3) 4 4) 6

45. The term independent of x in the expansion of $\left(\frac{x^2}{2} - \frac{2}{x}\right)^9$ is equal to

1) ${}^9C_6\,(2^3)$ 2) ${}^9C_5\,(2)^4$ 3) ${}^9C_7\,(2)^5$ 4) $-{}^9C_6\,(2^3)$

46. If $X = \frac{1}{3} + \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9} + \ldots$ then $x^2 + 2x - 2 =$

1) 0 2) 1 3) 2 4) –1

47. The value of ${}^4C_3 + {}^5C_3 + {}^6C_3 + {}^7C_3 + {}^8C_3 + {}^9C_3 + {}^{10}C_3 + {}^{11}C_3 + {}^{12}C_3 + {}^{13}C_3$ is equal to

1) ${}^{13}C_4 - 1$ 2) ${}^{13}C_4$ 3) ${}^{13}C_4 + 1$ 4) ${}^{14}C_4 - 1$

48. The maximum number of points of intersection of 5 circles and 5 straight lines is

1) 50 2) 40 3) 100 4) 80

49. The number of sides of a polygon having 90 diagonals is

1) 45×87 2) 15 3) 12 4) 6

50. 3 vertices are selected from the vertices of a regular hexagon, then the probability that they forms an equilateral triangle is

1) $\frac{2}{10}$ 2) $\frac{1}{10}$ 3) $\frac{3}{10}$ 4) $\frac{7}{10}$

51. In a class there are an event are 60 boys and 40 girls. Among the boys as well as girls, half of them are Tamilians. If a student is selected at random then the probability of selecting a boy or Tamilian is

1) $\frac{3}{5}$ 2) $\frac{4}{5}$ 3) $\frac{2}{5}$ 4) $\frac{1}{5}$

52. A man speaks truth in 60% cases. He throws a die and reports that it is a six. The probability that it is actually a six is

1) $\frac{3}{8}$ 2) $\frac{3}{13}$ 3) $\frac{5}{6}$ 4) $\frac{5}{8}$

53. The range of random variable x = {1, 2, 3, ...} and the probabilities are given by P (x = k) $= \frac{c^k}{k!}$ then c =

1) $\log_e^2$ 2) $\log_e^3$ 3) $\log_3^2$ 4) $\log_2^3$

54. A Poisson variable x is such that P(x = 2) = 9p (x = 4) + 90.P(x = 6) then mean and standard deviation are

1) 1, 1 2) 1, 2 3) 2, 2 4) 2, $\sqrt{2}$

55. Arithmetic mean of the data

x : 1 2 3 ..... n

f : 1 2 3 ..... n is

1) $\frac{n(n+1)}{2}$ 2) $\frac{(n+1)}{2}$ 3) $\frac{(2n+1)}{3}$ 4) $\frac{n(2n+1)}{4}$

56. The median of 5, 19, 14, 6, 8, 9, 12, 13, 21 is

1) 9 2) 13 3) 14 4) 12

57. If $i = \sqrt{-1}$ then $\frac{e^{ix} + e^{-ix}}{2} =$

1) $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - ....$ 2) $1 + \frac{x^2}{2!} + \frac{x^4}{4!} + ...$

3) $1 - \frac{x^3}{3!} + \frac{x^5}{5!} - ...$ 4) $1 + \frac{x^3}{3!} + \frac{x^5}{5!} + ...$

58. The complex numbers z_1, z_2 and z_3 satisfying $\frac{z_1 - z_3}{z_2 - z_3} = \frac{1 - i\sqrt{3}}{2}$ are the vertices of a triangle which is:

1) of area zero 2) right angled isosceles

3) Equilateral 4) obtuse – angled isosceles

59. The product of all the four values of $2^{-3/4}\left(1+i\sqrt{3}\right)^{3/4}$ is

1) 0 2) 1 3) -1 4) $\frac{1}{2}$

60. If $\left(\frac{3}{2}+i\frac{\sqrt{3}}{2}\right)^{50} = 3^{25}(x+iy)$ where x and y are real, then the ordered pair (x, y) is

1) $(-3, 0)$ 2) $(0, 3)$ 3) $(0, -3)$ 4) $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

61. Centre of circle whose pair of normals is $x^2 - 2xy - 3x + 6y = 0$ is

1) $\left(3, \frac{3}{2}\right)$ 2) $\left(3, -\frac{3}{2}\right)$ 3) $\left(\frac{3}{2}, 3\right)$ 4) $\left(-3, \frac{3}{2}\right)$

62. If two distinct chords, drawn from the point (p, q) to the circle $x^2 + y^2 = px + qy$ (where $pq \neq 0$) are bisected by the x - axis then

1) $q^2 < 8p^2$ 2) $q^2 > 8p^2$ 3) $p^2 < 8q^2$ 4) $p^2 > 8q^2$

63. The pair of tangents drawn from origin to the circle $x^2 + y^2 + 4x + 2y + 3 = 0$ is

1) $(2x + y)^2 = 3(x^2 + y^2)$ 2) $(4x + 2y)^2 = 3(x^2 + y^2)$

3) $(2x - y)^2 = 3(x^2 + y^2)$ 4) Not existing

64. The triangle PQR is inscribed in the circle $x^2 + y^2 = 25$ if Q = (3, 4) and R = (–4, 3) then QPR =

1) $\frac{\pi}{2}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

65. $x^2 + y^2 + 21x + 5 = 0$ and $x^2 + y^2 + 21y + 5 = 0$ are two circles. 'P' is a point on the line $x - y = 0$. If PA, PB are the lengths of the tangents from P to the two circles and PA = 3 then PB =

1) 1 2) 3 3) 8 4) 5

66. Minimum distance between the curves $y^2 = x - 2$ and $x^2 = y - 2$ is equal to

1) $\frac{3\sqrt{2}}{4}$ 2) $\frac{5\sqrt{2}}{4}$ 3) $\frac{7\sqrt{2}}{4}$ 4) $\frac{7}{4\sqrt{2}}$

67. The length of the chord of the parabola $x^2 = 4ay$ passing through the vertex and having slope $\tan\alpha$ is

1) $4a \operatorname{cosec}\alpha \cot\alpha$ 2) $4a \tan\alpha \sec\alpha$ 3) $4a \cos\alpha \cot\alpha$ 4) $4a \sin\alpha \tan\alpha$

68. The foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide. The value of b^2 is

1) 5 2) 9 3) 7 4) 3

69. S and T are the foci of the ellipse $\left(\frac{x^2}{a^2}\right) + \left(\frac{y^2}{b^2}\right) = 1$ and B is an end of the minor axis. If STB is an equilateral triangle, then eccentricity of the ellipse is

1) $\frac{1}{4}$ 2) $\frac{1}{3}$ 3) $\frac{1}{2}$ 4) $\sqrt{\frac{3}{2}}$

70. Angle between asymptotes of the hyperbola $2xy + 2x + 2y + 1 = 0$ is.....

1) $\frac{\pi}{3}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{6}$ 4) $\frac{\pi}{2}$

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

1) $-\frac{1}{2}\sqrt{\frac{5+x}{1+x}} + c$ 2) $\frac{1}{2}\sqrt{\frac{3-x}{1+x}} + c$

3) $-\frac{1}{2}\sqrt{\frac{3-x}{1+x}} + c$ 4) $\frac{1}{2}\sqrt{\frac{5+x}{1+x}} + c$

72. $\int \frac{dx}{\sqrt{x(6-x)}} =$

1) $\sin^{-1}\left(\frac{x+3}{3}\right) + C$ 2) $\sin^{-1}\left(\frac{x-3}{3}\right) + C$

3) $\cos^{-1}\left(\frac{x+3}{3}\right) + C$ 4) $\cos^{-1}\left(\frac{x-3}{3}\right) + C$

73. $\int \frac{(x-x^3)^{1/3}}{x^4} dx$

1) $\frac{3}{8}\left(\frac{1}{x^2}-1\right)^{4/3} + c$ 2) $-\frac{3}{8}\left(\frac{1}{x^2}-1\right)^{4/3} + c$

3) $\frac{3}{4}\left(x-x^3\right)^{4/3} + c$ 4) $-\frac{3}{4}\left(x-x^3\right)^{4/3} + c$

74. If $\int \frac{2\cos x + 3\sin x}{3\cos x + 4\sin x} dx = Ax + B \ln |3\cos x + 4\sin x| + c$, then $A + B =$

1) $\frac{18}{25}$ 2) $\frac{1}{25}$ 3) $\frac{17}{25}$ 4) $\frac{19}{25}$

75. $\int_{-1}^{4} f(x)\,dx = 4$ and $\int_{2}^{4} (3 - f(x))\,dx = 7$, then the value of $\int_{2}^{-1} f(x)\,dx$ is equal to

1) 5 2) – 3 3) –5 4) –12

76. The area bounded by the curve $y = f(x) = x^4 - 2x^3 + x^2 + 3$, x – axis and ordinates corresponding to minimum of the function f (x) is

1) 1 2) 91/ 30 3) 30/ 9 4) 4

77. The value of $\lim_{n\to\infty} \frac{(n!)^{1/n}}{n}$ is

1) 1 2) $\frac{1}{e^2}$ 3) $\frac{1}{2e}$ 4) $\frac{1}{e}$

78. Differential equation by eliminating A, B, C, D from $y = (Ax + B)e^x + c + D\log 10$ has the order

1) 2 2) 3 3) 4 4) 5

79. Equation of the curve through $\left(0, \frac{\pi}{4}\right)$ and satisfying the differential equation $e^x \tan y\, dx + (1 + e^x) \sec^2 y\, dy = 0$ is .....

1) $(1 + e^x) = 2 \tan y$ 2) $(1 + e^{yx}) = 2 \sec y$

3) $(1 + e^x) \tan y = 2$ 4) $(1 + e^x) \tan y = c$

80. Solution of $(x + 2y^3) \frac{dy}{dx} = y$ is

1) $x = y^3 + cy$ 2) $x = y^3 + cy^2$ 3) $x^3 = y^3 + cy$ 4) $x = y^2 + cy$

PHYSICS

81. A wire has a mass (0.3 ± 0.003) g, radius (0.5 ± 0.005) mm and length (6 ± 0.06) cm. The maximum percentage error in the measurement of its density is

1) 1 2) 2 3) 3 4) 4

82. The Henry can be written as

a) weber/ ampere b) volt-second / ampere

c) joule/ampere2 d) ohm-sec

1) a is correct 2) a & b are correct

3) a, b & c are correct 4) a, b, c & d are correct

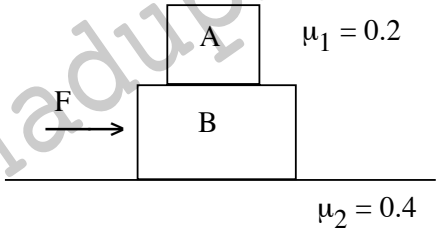
83. If $\bar{p}$ and $\bar{q}$ are two unit vectors and the angle between them is 60° then $\frac{(1 + \bar{p}.\ \bar{q})}{(1 - \bar{p}.\ \bar{q})}$ is

1) 2 2) 3 3) 0 4) $\frac{1}{2}$

84. The equation of motion of a horizontally projected body from the top of a tower is given by $y = ax^2$. Here 'a' is a constant. The velocity of projection is

1) $\sqrt{\frac{g}{a}}$ 2) $\sqrt{\frac{2g}{5a}}$ 3) $\sqrt{\frac{3g}{2a}}$ 4) $\sqrt{\frac{g}{2a}}$

85. In the figure m_A = 2 kg, and m_B = 4 kg. For what minimum value of 'F', A starts slipping over 'B' (g = 10 ms^{-2})



1) 24 N 2) 36 N 3) 12 N 4) 20 N

86. The apparent weight of a man in a lift is less than the real weight when the lift is going

1) down with uniform speed

2) up with an acceleration

3) up with a retardation

4) up with a uniform speed

87. From a sphere of radius 1 m, a sphere of radius 0.5 m is removed from the edge. Then shift in centre of mass is

1) $\frac{1}{14}$ m 2) $\frac{13}{14}$ m 3) $\frac{1}{13}$ m 4) $\frac{5}{13}$ m

88. The bob of a pendulum is released from a horizontal position. If the length of pendulum is 2 m, what is the speed with which the bob arrives at the lower most point. Assume that 10% of its energy is dissipated against air resistance. (Take g = 10 ms^{-2})

1) 4 ms^{-1} 2) 6 ms^{-1} 3) 8 ms^{-1} 4) 10 ms^{-1}

89. From a disc of radius R and mass M, a circular hole of diameter R, whose rim passes through the centre is cut. The moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre is

1) $\frac{15MR^2}{32}$ 2) $\frac{13MR^2}{32}$ 3) $\frac{11MR^2}{32}$ 4) $\frac{9MR^2}{32}$

90. A small object of uniform density rolls up a curved surface with an initial velocity V. It reaches up to a maximum height $\frac{3V^2}{4g}$ with respect to initial position. The object is

1) ring 2) solid sphere 3) hollow sphere 4) disc

91. Two bodies of massed m1 and m2 are initially at rest at infinite distance apart. They are then allowed to move toward each other under mutual gravitational attraction. Their relative velocity of approach at a separation distance r between them is

1) $\left[\frac{2G(m_1 + m_2)}{r}\right]^{1/2}$ 2) $\left[\sqrt{\frac{2G}{r}}\ \frac{(m_1 + m_2)}{2}\right]^{1/2}$

3) $\left[\frac{r}{2G(m_1 + m_2)}\right]^{1/2}$ 4) $\left(\frac{2G}{r} m_1 m_2\right)^{1/2}$

92. The time period of oscillation of the particle in SHM is 'T'. Then match the following

Column – I	**Column – II**
a) $\frac{3}{8}$ th of oscillation from extreme position	e) $\frac{T}{6}$
b) $\frac{3}{8}$ th of oscillation from mean position	f) $\frac{T}{3}$
c) minimum time to move from +A/2 to – A/2 position	g) $\frac{7T}{12}$
d) $\frac{5}{8}$ th of oscillation from mean position	h) $\frac{5T}{12}$

1) a – e, b – g, c – f, d – h 2) a – f, b – h, c – e, d – g

3) a – f, b – e, c – h, d – g 4) a – e, b – f, c – g, d – h

93. Modulus of rigidly of ideal liquid is

1) infinity

2) zero

3) unity

4) some finite small non zero constant value

94. In case of a soap bubble, the ratio of work done to double the radius, double the surface area and double the volume is

1) 1 : 2 : 3 2) 3 : 1 : $(2^{2/3} - 1)$ 3) 1 : 4 : 8 4) 3 : 4 : 5

95. **Assertion (A):** The velocity of liquid flowing out of an orifice at the bottom of water tank is equal to the velocity of a freely falling body through the same depth.

Reason (R): As aeroplane moves fast on the runway the pressure is more on the upper surface of its wings and less on the bottom surface of the wings.

1) Both A and R are true, and R is correct explanation of

2) Both A and R are true, and R is not the correct explanation of A

3) A is true but R is false

4) A is false but R is true

96. **A:** The change in internal energy during melting of ice at 0°C is greater than 80 cal.

B: The change in internal energy during boiling of water in to steam at 100°C is greater than 540 calorie.

1) Both A and B are true 2) Both A and B are false

3) A is true and B is false 4) A is false and B is true

97. One metal rod of length 25 cm and coefficient of linear expansion 2×10^{-5} /C° is joined end to end with another metal rod of length 50cm and coefficient of linear expansion 1×10^{-5} / C°. The coefficient of volume expansion of composite rod is

1) 5×10^{-5} / C° 2) 4×10^{-5} / C° 3) $\frac{4}{3} \times 10^{-5}$ / C° 4) $\frac{5}{3} \times 10^{-5}$ / C°

98. A metal ball kept in a cooling room, cools from 72°C to 60°C in 10 minutes and to 52°C in next 10 minutes. The temperature of the cooling room is

1) 32°C 2) 30°C 3) 38°C 4) 36°C

99. The temperature of an ideal gas is increased from 27°C to 927°C. The rms speed of its molecules will becomes

1) Twice 2) Half 3) Four times 4) One fourth

100. 'n' moles of an ideal gas undergo a process in which the temperature changes with volume as $T = KV^2$. The work done by the gas as the temperature changes from T_0 to $4T_0$ is (R = universal gas constant)

1) $3nRT_0$ 2) $\frac{5}{2} nRT_0$ 3) $\frac{3}{2} nRT_0$ 4) zero

101. First overtone frequency of a closed organ pipe is equal to the first overtone frequency of an open organ pipe. Further n^{th} harmonic of closed organ pipe is also equal to the m^{th} harmonic of open pipe, where 'n' & 'm' are

1) 5, 4 2) 7, 5 3) 9, 6 4) 7, 3

102. An observer moves towards a stationary source of sound with a velocity one – fifth of the velocity of sound. What is the percentage increase in the apparent frequency?

1) zero 2) 0.5 % 3) 5% 4) 20 %

103. Angle of minimum deviation is equal to the angle of prism A of an equilateral glass prism. The angle of incidence at which minimum deviation will be obtained is

1) 60° 2) 30° 3) 45° 4) $\sin^{-1}(2/3)$

104. A compound microscope has an objective of focal length 2 cm and an eye–piece of focal length 6.25 cm which are separated by 15 cm. If the final image is formed at the least distance of distinct vision 25 cm, distance of the object from the objective is

1) 2 cm 2) 1.5 cm 3) 2.4 cm 4) 4 cm

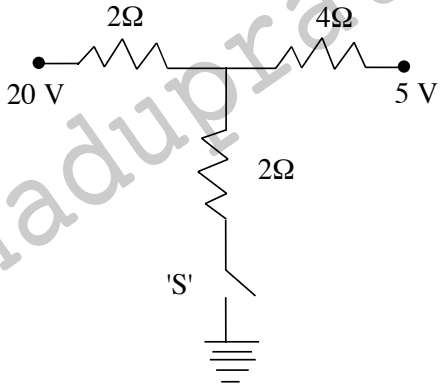
105. Young's double slit experiment is made in a liquid. The 10th bright fringe in liquid lies where 6th dark fringe lies in vacuum. The refractive index of liquid is

1) 1.8 2) 1.54 3) 1.67 4) 1.2

106. A2μF capacitor C_1 is charged to a voltage 100 V and a 4μF capacitor C_2 is charged to a voltage 50 V. The capacitors are connected in parallel. The loss of energy due to parallel connection is (nearly)

1) 1.7 J 2) 1.7×10^{-1}J 3) 17 J 4) 1.7×10^{-4}J

107. As the switch 'S' is closed in the circuit shown in figure, current passed through it is



1) 4.5 A 2) 6.0 A 3) 3.0 A 4) Zero

108. A conductor wire, having 1029 free electrons m–3 carries a current of 20 A. If the crosssection of the wire is 1 mm2, then the drift velocity of the electrons will be of the order of

1) 10^{-3} ms^{-1} 2) 10^{-5} ms^{-1} 3) 10^{-1} ms^{-1} 4) 10 ms^{-1}

109. A potentiometer having the potential gradient of 2mVcm^{-1} is used to measure the difference of potential across a resistance of 10 Ω . If a length of 50cm of the potentiometer wire is required to get the null point the current passing through 10 Ω resistor is (in mA)

1) 10 2) 5 3) 2 4) 1

110. A wire of length L is shaped into a circle and then bent in such a way that the two semicircles are perpendicular. The magnetic moment of the system when current i flows through the system is

1) $\frac{\sqrt{2}\,iL^2}{8\pi}$ 2) $\frac{\sqrt{3}\,iL^2}{4\pi}$ 3) $\frac{iL^2}{4\pi}$ 4) $\frac{iL^2}{2\pi}$

111. The ratio of shunt resistance connected to a galvanometer and resistance of ammeter is 11 : 10. If the current required for the full scale deflection of galvanometer is 1 mA, then how much maximum current can be measured by ammeter

1) 9 mA 2) 10 mA 3) 11 mA 4) 21 mA

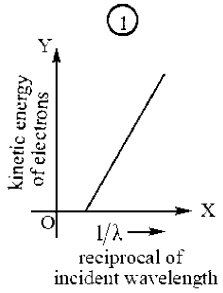
112. If a magnet is suspended at angle 30° to the magnetic meridian, the dip needle makes angle of 45° with the horizontal. The real dip is

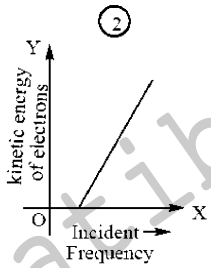
1) $\tan^{-1}(\sqrt{3}/2)$ 2) $\tan^{-1}(\sqrt{3})$ 3) $\tan^{-1}\frac{3}{\sqrt{2}}$ 4) $\tan^{-1}\frac{2}{\sqrt{3}}$

113. The current and voltage in an a.c. circuit containing inductance and resistance are given by i = 2 sin 314 t amperes and v = 60 sin (314 t + $\pi/3$) volts respectively. The value of the resistance in the circuit is

1) 15 Ω 2) $15\sqrt{3}$ Ω 3) 30 Ω 4) 20 Ω

114. In photoelectric effect, from the following two graphs, the ratio of the slopes of (1) and (2) is





1) 1 2) 6.6×10^{-34} J – sec

3) 3×10^{8} m / s 4) 1.6×10^{-19} coul

115. Davisson and Germer's experiment is the experimental proof for

1) Proton wave nature

2) Neutron wave nature

3) Electron wave nature

4) – particle wave nature

116. A basic communication system consists of

A) transmitter B) information source

C) user of information D) channel

E) receiver

Choose the correct sequence in which these are arranged in a basic communication system

1) ABCDE 2) BADEC 3) BDACE 4) BEADC

117. If λ is the decay constant of radio active isotope then the half life period and the mean life of sample is

1) $\frac{1}{\lambda}$ and $\frac{\log_e 2}{\lambda}$ 2) $\frac{\log_e 2}{\lambda}$ and $\frac{1}{\lambda}$

3) $\lambda \log_e 2, \frac{1}{\lambda}$ 4) $\frac{\lambda}{\log_e 2}$ and $\frac{1}{\lambda}$

118. The ratio of the maximum and minimum wavelengths in Bracket series of hydrogen spectra is

1) $\frac{25}{9}$ 2) $\frac{17}{6}$ 3) $\frac{9}{5}$ 4) $\frac{4}{3}$

119. A transistor is connected in common emitter configuration. The collector supply is 8 V and the voltage drop across a resistor of 800 Ω in the collector circuit is 0.5 V. If the current gain factor (α) is $\frac{25}{26}$, then base current will be

1) 24 μA 2) 25 μA 3) 28 μA 4) 30 μA

120. The average magnetic energy density of an electromagnetic wave of wavelength λ travelling in freespace is given by [B = $B_{R.M.S}$]

1) $\frac{B^2}{2\lambda}$ 2) $\frac{B^2}{2\mu_0}$ 3) $\frac{2B^2}{\mu_0\lambda}$ 4) $\frac{B}{\mu_0\lambda}$

CHEMISTRY

121. In an atom the order of increasing energy of electrons with quantum numbers

i) n = 4, *l* = 1 ii) n = 4, *l* = 0

iii) n = 3, *l* = 2 and iv) n = 3, *l* = 1 is

1) (ii) < (iv) < (i) < (iii) 2) (i) < (iii) < (ii) < (iv)

3) (iv) < (ii) < (iii) < (i) 4) (iii) < (i) < (iv) < (ii)

122. The number of radial nodes of 3s and 2 p orbitals respectively are

1) 0, 2 2) 2, 0 3) 1, 2 4) 2, 1

123. The number of electrons in the valence shell of the central atom of a molecule is 8. The molecule is

1) BeH_2 2) SCl_2 3) SF_6 4) BCl_3

124. The molecular interactions responsible for hydrogen bonding in HF

1) Dipole – dipole 2) Dipole – induced dipole

3) Ion – dipole 4) Ion – induced dipole

125. The increasing order of the atomic radius of Si,S,Na,Mg, A*l* is

1) Na < A*l* < Mg < S < Si 2) Na < Mg < Si < A*l* < S

3) Na < Mg < A*l* < Si < S 4) S < Si < A*l* < Mg < Na

126. In which of the following reactions, H_2O_2 acts as a reducing reagent?

1) $PbS(s) + 4\ H_2O_2\ (aq) \xrightarrow{H^+} PbSO_4\ (s) + 4H_2O\ (l)$

2) $HOCl + H_2O_2 \xrightarrow{H^+} H_3O^+ + Cl^- + O_2$

3) $Mn^{2+} + H_2O_2 \xrightarrow{OH^-} Mn^{4+} + 2OH^-$

4) $2Fe^{2+} + H_2O_2 \xrightarrow{OH^-} 2Fe^{3+} + 2OH^-$

127. Regarding Solvay process, incorrect statement is

1) It is based on low solubility of $NaHCO_3$

2) By product is $CaCl_2$

3) Ammonia can be recycled

4) K_2CO_3 can be prepared

128. Initial product of diborane reacts with ammonia is formulated as

1) $[BH_2(NH_3)_2]^+ [BH_4]^-$ 2) H_3BO_3

3) HBO_2 4) $B_3N_3H_6$

129. **Assertion (A):** $[SiF_6]^{2-}$ is exist but not $[SiCl_6]^{2-}$.

Reason (R): Six larger chloride ions canot be accommodated around smaller Si^{4+} ion.

The correct answer.

1) Assertion is true, Reason is true, Reason is the correct explanation for Assertion

2) Assertion is true, Reason is true, Reason is not a correct explanation for Assertion

3) Assertion is true, Reason is false

4) Assertion is false, Reason is true

130. At T(K), the partial pressures of SO_2, O_2 and SO_3 are 0.662, 0.100 and 0.331atm respectively for the reaction

$2\,SO_{2(g)} + O_{2(g)} \rightleftharpoons 2\,SO_{3(g)}$ at equilibrium.

What is the partial pressure of O_2, when that of SO_2 and SO_3 are equal at the same temperature?

1) 0.4 2) 0.8 3) 0.25 4) 2.5

131. At T (K), the ratio of Kinetic energies of 4 g of $H_{2(g)}$ and 8 g of $O_{2(g)}$ is

1) 1 : 4 2) 4 : 1 3) 2 : 1 4) 8 : 1

132. Identify the copolymer from the following:

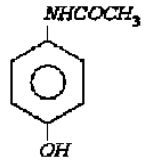
1) $[CF_2 - CF_2]_n$

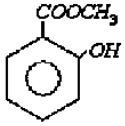
2) $[CH_2 - \underset{\displaystyle Cl}{\underset{|}{C}} = CH - CH_2]_n$

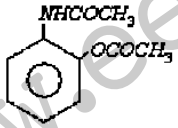
3) $[CH_2 - \underset{\displaystyle Cl}{\underset{|}{CH}}]_n$

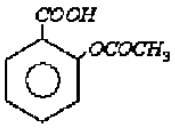
4) $[CH_2 - CH = CH - CH_2 - \underset{\displaystyle C_6H_5}{\underset{|}{CH}} - CH_2]_n$

133. Identify Aspirin from the following

1) 

2) 

3) 

4) 

134. Which among the following has highest vapour pressure?

1) 1 M urea 2) 1 M NaCl 3) 3 M glucose 4) 1 M CaCl2

135. Gold numbers of protective colloids A, B, C and D are 0.5, 0.01, 0.1 and 0.005 respectively. The correct order of their protective power is

1) C < B < D < A 2) A < C < B < D

3) A < B < C < D 4) D < A < C < B

136. The structure of $XeOF_4$ is

1) Square planar 2) Square pyramidal

3) Pyramidal 4) Trigonal bipyramidal

137. Which one of the following is used in the preparation of cellulose nitrate?

1) KNO_3 2) HNO_3 3) KNO_2 4) HNO_2

138. Hydrolysis products of CF3 are

1) HF, $HClO_3$ 2) HF, HOCl 3) HCl, HOF 4) HF, $HClO_2$

139. A certain quantity of electricity is passed through aqueous $Al_2(SO_4)_3$ and $CuSO_4$ solutions connected in series. 0.09 g of Al is deposited on cathode during electrolysis. The amount of copper deposited on cathode in grams is ? (At.wt.of Al = 27, Cu = 63.6)

1) 3.18 2) 0.318 3) 31.8 4) 0.636

140. The half-life of a first order reaction is 100 seconds at 280 K. If the temperature coefficient is 3.0. Its rate constant at 290 K in s^{-1} is

1) 6.93×10^{-2} 2) 2.08×10^{-3} 3) 2.08×10^{-2} 4) 6.93×10^{-3}

141. Lactose is a disaccharide of

1) β – D – Glucose and β – D – Galactose

2) α – D – Glucose and β – D – Ribose

3) α – D – Glucose and β – D – Galactose

4) α – D – Glucose and α – D – Fructose

142. The number of hydrogen bonds between Guanine & Cytosine and between Adenine & Thymine in DNA is

1) 1, 2 2) 3, 2 3) 3, 1 4) 2, 1

143. What is z in the following reaction sequence?

$$C_6H_5NH_2 \xrightarrow[\text{ii) } H_3PO_2 + H_2O]{\text{i) } NaNO_2 + HCl \,/\, 273\ K} Z$$

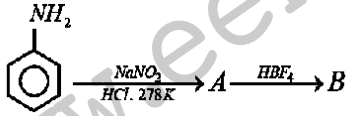
iii) CO.HCl: anhydrous $AlCl_3$ / CuCl

1) C_6H_5OH 2) C_6H5CHO 3) C_6H_6 4) $C_6H_5CO_2H$

144. Carbylamine test is used to detect which one of the following?

1) C_6H_5CHO 2) $C_6H_5CO_2H$ 3) $C_6H_5NH_2$ 4) C_6H_5OH

145. In the chemical reactions,



the compounds A and B respectively are

1) nitrobenzene and chlorobenzene

2) nitrobenzene and fluorobenzene

3) phenol and benzene

4) benzene diazonium chloride and fluorobenzene

146. The number of octahedral and tetrahedral holes respectively present in a hexagonal close packed (hcp) crystal of '*X* 'atoms are

1) *X*, 2*X* 2) *X*, *X* 3) 2*X*, *X* 4) 2*X*, 2*X*

147. The hybridisation of Ni in the complex tetra cyanonickelate (II) is

1) sp^3 2) dsp^2 3) $sp^3 d^2$ 4) $d^2 sp^3$

148. Which one of the following is the ratio of the lowering of vapour pressure of 0.1M aqueous solutions of $BaCl_2$, NaCl and $Al_2(SO_4)_3$ respectively?

1) 2 : 3 : 5 2) 3 : 2 : 5 3) 5 : 2 : 3 4) 5 : 3 : 2

149. **Assertion (A):** At 300 K, kinetic energy of 32 gms of methane is equal to the kinetic energy of 32 gms of oxygen.

Reason (R): At constant temperature, kinetic energy of one mole of all gases is equal.

The correct answer is

1) Both A and R are true and R is the correct explanation of A.

2) Both A and R are true but R is not the correct explanation of A.

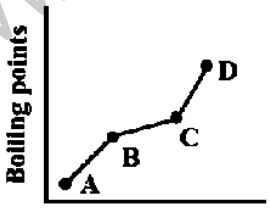
3) A is true, R is not true.

4) A is not true but R is true.

150. Which of the following give positive molybdate test

1) Pyrophosphates 2) Sulphates 3) Carbonates 4) Nitrates

151. From the graph A, B, C, D are



1) H_2O, H_2S, H_2Se, H_2Te 2) NH_3, PH_3, AsH_3, SbH_3

3) HF, HCl, HBr, HI 4) CH_4, SiH_4, GeH_4, SnH_4

152. Which is used as a ligand in the metallurgy of 'Ni' by mond's process?

1) NO 2) CO 3) SiO_2 4) CO_2

153. Among the following molecules

i) XeO_3

ii) $XeOF_4$

iii) XeF_6 those having same number of lone pair electrons on Xe are

1) i & ii only 2) i & iii only

3) ii & iii only 4) i, ii & iii

154. $2\ HCHO \xrightarrow{Conc.NaOH} X + Y$. In this reaction X and Y are

1) HCOONa; CH_3OH 2) HCOOH, HCOOH

3) CH_3COOH ; CO_2 4) CH_4, CO_2

155. Antioxidant in the following is

1) Sodium benzoate 2) Alitame

3) Hippuric acid 4) Butylated hydroxyl toluene

156. Which one of the following is most acidic?

1) H_2O 2) H_2S 3) H_2Te 4) H_2Se

157. An oxide of nitrogen (X) is formed when Z is reacted with P_2O_5 . X is soluble in water and gives Z. Which one of the following is Z?

1) HNO_3 2) $H_3N_2O_2$ 3) HNO_2 4) HN_3

158. Which of the following complex compound shows optical isomerism?

1) $[Cu(NH_3)_4]^{2+}$ 2) $[Zn(Cl)_4]^{2-}$ 3) $[Cr(C_2O_4)_3]^{2-}$ 4) $[Co(CN)_6]^{3-}$

159.

LIST –1 **[Colloidal solution]**	LIST - 2 **[Example]**
A) Liquid in gas	1) Milk
B) Solid in gas	2) Boot polish
C) Liquid in liquid	3) Smoke
D) Solid in liquid	4) Cloud
	5) Gem stone

	A	B	C	D
1)	4	3	1	2
3)	3	1	2	5

	A	B	C	D
2)	2	1	5	4
4)	1	4	3	2

160. Which of the following statements is not correct?

1) $La(OH)_3$ is less basic than $Lu(OH)_3$

2) In lanthanide series, ionic radius of Ln^{3+} ions decreases

3) La is actually an element of transition series rather than lanthanide series

4) Atomic radii of Zr and Hf are nearly same because of lanthanide contraction

KEY

1-1; 2-4; 3-2; 4-2; 5-2; 6-2; 7-3; 8-1; 9-1; 10-4; 11-2; 12-2; 13-4; 14-3; 15-4; 16-2; 17-2; 18-4; 19-2; 20-3; 21-4; 22-4; 23-3; 24-3; 25-2; 26-2; 27-4; 28-4; 29-2; 30-2; 31-1; 32-4; 33-4; 34-1; 35-4; 36-2; 37-2; 38-1; 39-3; 40-1; 41-4; 42-3; 43-2; 44-2; 45-1; 46-1; 47-4; 48-4; 49-2; 50-2; 51-2; 52-2; 53-1; 54-1; 55-3; 56-4; 57-1; 58-3; 59-2; 60-4; 61-1; 62-4; 63-1; 64-3; 65-2; 66-3; 67-2; 68-3; 69-3; 70-4; 71-3; 72-2; 73-2; 74-3; 75-3; 76-2; 77-4; 78-2; 79-3; 80-1; 81-4; 82-4; 83-2; 84-4; 85-2; 86-3; 87-1; 88-2; 89-2; 90-4; 91-1; 92-2; 93-2; 94-2; 95-3; 96-3; 97-2; 98-4; 99-1; 100-3; 101-3; 102-4; 103-1; 104-3; 105-1; 106-4; 107-1; 108-1; 109-1; 110-1; 111-3; 112-1; 113-1; 114-3; 115-3; 116-2; 117-2; 118-1; 119-2; 120-2; 121-3; 122-2; 123-2; 124-1; 125-4; 126-2; 127-4; 128-1; 129-1; 130-1; 131-4; 132-4; 133-4; 134-1; 135-2; 136-2; 137-2; 138-4; 139-2; 140-3; 141-1; 142-2; 143-2; 144-3; 145-4; 146-1; 147-2; 148-2; 149-4; 150-1; 151-4; 152-2; 153-4; 154-1; 155-4; 156-3; 157-1; 158-3; 159-1; 160-1.

(ఈ నమూనా ప్రశ్నపత్రాన్ని శ్రీచైతన్య విద్యాసంస్థలకు చెందిన నిపుణులు రూపొందించారు)