H.S. 1^{st} Year Mathematics

Question Bank, Chapter wise

Chapter 1 ***Set*** Marks(7)

1.(a) Are ϕ and $\{\phi\}$$same$?

(b). $n(\{\phi\})$ = ?

(c.) If n(A)=2, then find the value of $n\big(P(A)\big)$.

(d). Is $n(A-B)=n(A)-n(B)$?

(e). If $X=\phi$, then $n(P(X))$ =?

2(a) If A={1,2,3,4,5,6}, B={0,2,4,6,8}, then find $A\cup B, A\cap B$ and $A-B$.

(b). For any sets A and B prove that:

(i) $A-B\subseteq A$ (ii) A$\subseteq A\cup B$

(c.) In a class of 50 students, every student plays football or cricket. If 32 of them play football and 35 play cricket, then find the numbers of students who play both the games and only football.

(d). Establish that:

$$n(A\cup B)=n(A)+n(B)-n(A\cap B)$$

(e). For any sets A and B prove that:

(i) $A-B=A\cap B^{/}$ (ii) $(A-B)\cup B=A\cup B$

(f). If A={0, ½, 1/3}, B={0,1), then find $A\cup B, A\cap B$ and $A-B$.

(g). For any two sets A and B prove that

$$n(A-B)=n(A)-n(A\cap B)$$

(h). In a group of 90 people, 48 like coffee, 60 like tea and each person at least one of the two drinks. How many of the group like both drinks?

(i). If n(A-B)=10, n($A \cap B$)=5 and n(B-A)=20, then find n(B) and n($A \cup B$).

(j). For any sets A and B, prove

(i). (A-B)∩(B-A)=ϕ (ii). A-B$\subseteq A \cup B$

(k). Every resident of a city can speak Hindi or English. If 75% of the population speaks Hindi and 60% speaks English, then what percentage can speak both the languages?

(l) Prove the following

(i). $A \cap B \subseteq A \cup B$ (ii). $A \cap \left(A^{/} \cup B\right) = A \cap B$

(m). Let A and B be sets. If $A \cap X = B \cap X = \phi$ and $\cup X = B \cup X$, then show that A=B.

(n). In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis only and not cricket? How many like tennis?

Chapter 2 *Relation and Function* Marks(8)

1. R is a relation in the set $A = \{1,2,3, \dots \dots 15\}$ such that $R = \{(x, y): y = 3x\}$. Find the domain and range of R.
2. Show that function $f(x) = 3x + 2$ is one –one and onto.
3. Find the domain and range of the function $\sqrt{9 - x^2}$
4. Prove that the function $f: N \rightarrow N$ defined by $f(x) = x^2 + 2$ is one-one but not onto.
5. Find the domain and range of the real function $f(x) = \frac{x-2}{3-x}$
6. Find the domain and range of the relation $R = \{(a, b): a \text{ is a multiple of } b \text{ and } a, b \in \{1,2,3,4,5,6,7\}\}$.
7. Define a real function. Find the domain and range of real function $f(x) = \sqrt{2x - 1}$
8. Prove that the function $f(x) = 3x + 2$ is a bijective mapping.
9. Define a relation. Write the relation $R = \{(a, b): b + 1 = 2a, a, b \in \{1,2,3, \dots,10\}\}$ in roster form.
10. Prove that the function $f: N \rightarrow N$ so that $f(x) = 2x^2 - 1$ is one-one but not onto.
11. Find the domain and range of the real function $f(x) = \frac{x^2}{x^2-1}$.
12. Determine the domain and range of the relation R defined by $R = \{(x, x + 5): x \in \{0, 1, 2, 3, 4, 5\}\}$.
13. Draw the graph of the following real functions:

    (i). $f(x) = |x|$ (ii) $f(x) = [x]$

14. Let $f = \{(1,1), (2,3), (0, -1), (-1, -3)\}$ be a function from Z to Z defined by $f(x) = ax + b$, for some integers a and b. Determine a and b.

Chapter 3 *Trigonometry* Marks(13)

1(a). Write the value of $sin15^0$

(b). Prove the following:

(i). $tan9^0.tan21^0.tan69^0.tan81^0 = 1$

(ii). $sin^2\frac{\pi}{4} + sin^2\frac{3\pi}{4} + sin^2\frac{5\pi}{4} + sin^2\frac{7\pi}{4} = 2$

(c.) Show that (i) $tan50^0 = tan40^0 + 2tan10^0$ (ii) $cos20^0.cos40^0.cos80^0 = \frac{1}{8}$

(d) Solve the following equations:

(i). $\tan x + \cot x = 1$ (ii). $\sqrt{2}cos\theta + 1 = 0$

(e). Write the value of $sin225^0$

(f) If ABCD is a cyclic quadrilateral, then show that $\cos A + \cos B + \cos C + \cos D = 0$

(g). Prove that (i) $sin^2\frac{\pi}{18} + sin^2\frac{\pi}{9} + sin^2\frac{7\pi}{18} + sin^2\frac{4\pi}{9} = 2$

(ii) $cos20^0.cos40^0.cos60^0.cos80^0 = \frac{1}{16}$

(h). (i).$\left(1 + cos\frac{\pi}{8}\right)\left(1 + cos\frac{3\pi}{8}\right)\left(1 + cos\frac{5\pi}{8}\right)\left(1 + cos\frac{7\pi}{8}\right) = \frac{1}{8}$

(ii). $cos5\theta = 16cos^5\theta - 20cos^2\theta + 5cos\theta$

(i). What is the value of $cot\left(\frac{-5\pi}{4}\right)$

(j). Prove that

(a). $tan70^0 = 2tan50^0 + tan20^0$ (b). $\sin A + cosA = \sqrt{2}cos(45^0 - A)$

(C.). $cos^2\frac{\pi}{4} + cos^2\frac{3\pi}{4} + cos^2\frac{5\pi}{4} + cos^2\frac{7\pi}{4} = 2$ (d). $16sin10^0sin30^0sin50^0sin70^0 = 1$

(k). Prove the following:

(i). $cos\frac{\pi}{32} = \frac{1}{2}\sqrt{\left[2 + \sqrt{\left\{2 + \sqrt{(2 + \sqrt{2})}\right\}}\right]}$

(ii). $sin^2A + sin^2B + sin^2C = 2 + 2cosAcosBcosC, \;\; where\ A + B + C = \pi$

(l). Solve the following

(i). $sin\theta + cos\theta = \sqrt{2}$ (ii). $tan\theta + cot\theta = 2$

(m). Mention the period of tan2x

(n). Prove the following

(i). $sin^2\frac{\pi}{18} + sin^2\frac{\pi}{9} + sin^2\frac{7\pi}{18} + sin^2\frac{4\pi}{9} = 2$ (ii). $tan(45^0 + \theta)tan(135^0 + \theta) = -1$

(iii). $cos20^0.cos40^0.cos60^0.cos80^0 = \frac{1}{16}$

(O). Prove the following

(i). $sin5\theta = 16sin^5\theta - 20sin^2\theta + 5sin\theta$

(ii). $2cos11\frac{1}{4}^0 = \sqrt{\left[2 + \sqrt{(2 + \sqrt{2})}\right]}$

(iii). $sinA - sinB + sinC = 4sin\frac{A}{2}cos\frac{B}{2}sin\frac{C}{2}, \quad A + B + C = \pi$

(p). Solve the following

(i). $tan^2\theta = 3cosec^2\theta - 1$ (ii). $cosx + \sqrt{3}sinx = 2$

(q). What is the value of $sin\left(-\frac{11\pi}{3}\right)$?

®. Prove the following:

(i). $2sin^2\frac{\pi}{6} + cosec^2\frac{7\pi}{6}cos^2\frac{\pi}{3} = \frac{3}{2}$

(ii). $sin^2\frac{\pi}{8} + sin^2\frac{3\pi}{8} + sin^2\frac{5\pi}{8} + sin^2\frac{7\pi}{8} = 2$

(iii). $sinA + cosA = \sqrt{2}\cos(45^0 - A)$

(s). Prove the followings:

(i). $cos6A = 32cos^6A - 48cos^4A + 18cos^2A - 1$

(ii). $cos^2 + cos^2\left(A + \frac{\pi}{3}\right) + cos^2\left(A - \frac{\pi}{3}\right) = \frac{3}{2}$

(iii). $\frac{sin5A-2sin3A+sinA}{cos5A-cosA} = tanA$

(t). Solve the followings:

(i). $sin2x - sin4x + sin6x = 0$

(ii). $\sqrt{3}cosx + sinx = \sqrt{2}.$

Chapter 4 *Principle of Mathematical Induction(PMI)* Marks(4)

(a). For any natural number n, prove by mathematical induction that $1.2 + 2.3 + 3.4 + \cdots + n(n+1) = \frac{1}{3}n(n+1)(n+2)$.

(b). Prove that $2^{3n} - 1$ is divisible by 7.

(C.) By mathematical induction prove that

$$1^2 + 3^2 + 5^2 + \cdots + (2n-1)^2 = \frac{1}{3}n(2n-1)(2n+1).$$

(d). For $n \in N, prove\ that\ 5^n + 2.3^{n-1} + 1\ is\ divisible\ by\ 8$.

(e). By mathematical induction prove that $1 + 3 + 5 + \cdots + (2n-1) = n^2$

(f). With the help of mathematical induction, prove that the product of three consecutive natural numbers is always a multiple of 3.

(g). Prove by Mathematical Induction for all $n \in N$ that

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots + \frac{1}{2^n} = 1 - \frac{1}{2^n}$.

Chapter 5 *Complex Variable* Marks(7)

(a). What is the value of i^{401} $where\ i = \sqrt{-1}$.

(b). Express $(-1 + i)$ in polar form.

(c.) Solve: $x^2 + 3x + 9 = 0, \quad or \quad x^2 + x + 1 = 0.$

(d).If $z = 1 - i$, then mention the value of $arg(z)$.

(e). Find the square root of $3 - 4i$.

(f). If $x = 3 + 2i$, then prove that $x^4 - 4x^3 + 4x^2 + 8x + 39 = 0$.

(g). If ω is a complex cube root of 1, then show that $(3 + 3\omega + 5\omega^2)^6 = 64$.

(h). Write $z = i$ in trigonometric form.

(i). For any two complex numbers $z_1\ and\ z_2$, prove that (i) $|z_1.z_2| = |z_1|.|z_2|$

(ii) $arg(z_1z_2) = arg(z_1) + arg(z_2)$.

(j) Find the square root of $2x + (x^2 - 1)i$.

(k). If $(a + ib)(c + id) = x + iy, prove\ that\ x^2 + y^2 = (a^2 + b^2)(c^2 + d^2)$

(l). Write the two complex cube root of 1.

(m). If $z_1\ and\ z_2$are two complex number, then show that $|z_1 + z_2|^2 + |z_1 - z_2|^2 = 2\{|z_1|^2 + |z_2|^2\}$

(n). Find the complex number whose square is the complex number $a + 2 + i\sqrt{3a^2 - 8a - 3}$.

(o). If $z = 1 + i$, then mention the value of arg(z).

(p). (a). Convert the complex number $1 + i\sqrt{3}$ into polar form.

(b). Find real θ such that $\frac{3+2isin\theta}{1-2isin\theta}$ is purely real.

©. Reduce to the standard form:

$$\left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$$

Chapter 6 *Linear Inequality* Marks(4)

(1). Solve the inequation: $3(2-x) \geq 2(1-x)$.

(2). Solve the inequations and indicate the solution in the real line:

(i). $2(3-x) \geq \frac{x}{5} + 4$ (ii). $\frac{4x+3}{2x-5} < 6$.

(3). Solve the inequation and show the solution set in the number line:

$5(2x-3) \leq \frac{x}{3} + 1$.

(4). Solve the following system of inequalities and represent the solutions graphically on the number line: $2(x-1) < x+5$, $3(x+2) > 2-x$.

(5). Solve the inequation and show the solution set in the number line:

$5(2x-3) \leq \frac{x}{3} + 1$.

Chapter 7 *Permutation and Combination* Marks(7)

(1). ${}^{10}C_8 + {}^{10}C_1 = ?$

(2). Prove that ${}^{n-1}P_r + r.{}^{n-1}P_{(r-1)} = {}^{n}P_r$.

(3). Find the number of permutations of the letters of the word "COLLEGE" taken all together.

(4). How many diagonals are obtained by joining the vertices of a regular hexagon.

(5). If ${}^{n}P_r = {}^{n}C_r.x$, $then\ find\ x$.

(6). Prove that

(i). $1.1P_1 + 2.2P_2 + 3.3P_3 + \cdots + n.nP_n = n + 1P_{n+1} - 1$

(ii). $(2n)! = \{1.3.5 \ldots..(2n-1)\}2^n\, n!$

(7). In how many ways can the letters of the word 'DIRECTOR' be arranged in the form of words so that the two R's do not come together.

(8). If a polygon has 44 diagonals, find the number of its sides.

(9). For what values of r, $nC_r = nP_r$.

(10). Prove:

(i). $n - 1P_r + r \times n - 1P_{r-1} = nP_r$

(ii). $nC_r + nC_{r-1} = n + 1C_r$

(iii). $\frac{1}{2!} + \frac{2}{3!} + \frac{3}{4!} + \cdots + \frac{n}{(n+1)!} = 1 - \frac{1}{(n+1)!}$

(11). In how many ways can 7 boys and 5 girls be arranged in a row so that no two girls come together?

(12). How many triangles can be obtained when the vertices of a hexagon are joined.

(13). If $nC_x = nC_y\ and\ x \neq y, then\ x + y = ?$

(14). (i). If $m + nP_2 = 72, and\ m - nP_2 = 6$, then find the values of m and n.

(ii). If $n + 2C_8 : n - 2P_4 = 57:16$, then prove that n=19.

(15). (i) In how many ways can the natural numbers lying between 10 and 1000 be formed with the digits 0, 3, 5, 7, 9.

(ii). How many 5-member committees can be formed from 8 teachers and 3 students so that a particular teacher is always selected for each committee.

(16). (i). Prove that 0!=1.

(ii). Write the relation between ${}^{n}P_{r}$ and ${}^{n}C_{r}$, where $0 < r \leq n.$

(iii). Find r if $5 \times {}^{4}P_{r} = 6 \times {}^{5}P_{r-1}$ OR

Prove that ${}^{n}C_{r} + {}^{n}C_{r-1} = {}^{n+1}C_{r}$

(iv). Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that all vowels do not occur together. OR

A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected so that the team has at least one boy and one girl?

(17). Prove that 0!=1.

(18).(a). Find r if $5x^{4}P_{r} = 6x^{5}P_{r-1}$ OR Prove that

${}^{n}C_{r} + {}^{n}C_{r-1} = {}^{n+1}C_{r}.$

(b). Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that all vowels do not occur together. OR

A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected so that the team has at least one boy and one girl.

(19). Write the relation between ${}^{n}P_{r}$ and ${}^{n}C_{r}$, where $0 < r \leq n.$

Chapter 8 *Binomial Theaorem* Marks(7)

1. How many terms are there in the expansion $(a+bx)^{17}$.
2. Expand $(x+2y)^5$ using binomial Theorem.
3. Calculate the coefficient of x^6 in the expansion of $\left(x+\frac{1}{x^2}\right)^{13}$.
4. What is the middle term in the expansion of $(1+x)^{20}$.
5. Find middle term in the expansion of $\left(\frac{a}{x}+bx\right)^{12}$.
6. If the coefficients of 2nd , 3rd and 4th terms in the expansion of $(1+x)^{2n}$are in A.P., show that $2n^2-9n+7=0$.
7. What is the coefficient of x^r in the expansion of $(1+x)^n$.
8. Find the term independent of x in the expansion of $\left(2x+\frac{1}{5x^2}\right)^9$.
9. By using Binomial Theorem, find the value of 11^7.
10. Find middle term in the expansion of $\left(\frac{a}{x}+\frac{x}{a}\right)^{10}$.
11. Show that the coefficient of x^r in the expansion of $\left(x+\frac{1}{x}\right)^n$ is $\frac{n!}{\frac{1}{2}(n-r)!\frac{1}{2}(n+r)!}$.
12. If the first three consecutive terms in the expansion of $(1+x)^{2n}$ are in A.P., then prove that $n(2n-1)x^2-4nx+1=0$.
13. Find the coefficient of x^{10} in the expansion of $(1+x)^{20}$.
14. Show that the middle term in the expansion of $(1+x)^{2n}$ is $\frac{1.3.5....(2n-1)}{n!}2^n x^n$.
15. Using Binomial Theorem, prove that 6^n-5n always leaves remainder 1, when divided by 25.

Chapter 9 *Sequence and Series* Marks(5)

1. What is the sum of the cubes of first n-natural numbers?
2. (i). If the sum of first p,q and r terms of an A.P. are respectively a,b and c, then prove that

   $$\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0$$

   (ii). If a,b,c,d are in G.P., then show that ab, ca, bc, bd are also in G.P.

3. Write the condition under which three numbers a,b,c may be in A.P and G.P. both.
4. (i). If the sum of first n terms of an A.P. is m and that of first m terms is n, show that the sum of first (m+n) terms is –(m+n).

   (ii). Find the sum: (a). 1.3+2.5+3.7+…+n(2n+1)

   (b). .9+.99+.999+… to n terms.

5. If a, b, c are in A.P., then are $a\lambda,\ b\lambda\ and\ c\lambda$ in A.P.?

6. (i). If the arithmetic and geometric means of two positive numbers are A and G respectively, then show that A $\geq G$.

   (ii). Find the sum: (a). 5+55+555+… upto n terms.

   (b). 1.1+2.3+3.5+4.7+…up to n terms.

7. What is the sum of cubes of first n natural numbers.

8. (i). If a, b, c are in A.P. and a, b, d are in G.P., then prove that a, a-b, d-c are in G.P.

   (ii). Find the sum: (a). 1.2.3+2.3.4+3.4.5+…+n(n+1)(n+2).

   (b). $1^2-2^2+3^2-4^2+5^2-6^2+\cdots+1001^2-1002^2$

9. Let the sum of n, 2n, 3n terms of an AP be $S_1, S_2 and\ S_3$ respectively. Show that $S_3 = 3(S_2-S_1)$.

10. Find the sum of the following:

    (a). 8+88+888+… upto n terms.

    (b). $1^3+2^3+3^3+\cdots+n^3$

Chapter 10 *Straight Line* Marks (7)

1. What is the slope of x-axis.
2. If the length of the perpendicular from the origin upon the line $\frac{x}{a}+\frac{y}{b}=1$ is p, then prove that $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{p^2}$.
3. Find the angle between the lines $x-\sqrt{3}y=1$ *and* $\sqrt{3}x-y=4$.
4. Find the equation to the line which passes through (1,-3) and is parallel to 5x+7y=9.
5. Are the lines y=x and y+x=0 perpendicular?
6. Find the equation of a straight line in intercept form.
7. Find the equation of the straight line which is parallel to 2x-y+3=0 and passes through the point (2,9).
8. Find the distance of the point (-3,4) from the line 12x-5y+2=0.
9. What is the gradient of the line $\frac{x}{a}+\frac{y}{b}=1$.
10. Find the equation of the line passing through the points (1,3) and (-2,-1).
11. Find the equation of the line that passes through the point $\left(\frac{a}{2},\frac{b}{2}\right)$ and parallel to the line bx+ay+1=0.
12. Find the angle between the lines $x-\sqrt{3}y=2$ *and* $\sqrt{3}x-y=1$.
13. What is the inclination of the line y=x.
14. Find the equation of a straight line in gradient form.
15. If the length of the perpendicular from the origin upon the line $\frac{x}{a}+\frac{y}{b}=1$ is p, then prove that $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{p^2}$.
16. Find the equation of the straight line passing through the point (3, 2) and perpendicular to the line x-2y+3=0.
17. Find the equation of the line passing through the point (-3, 5) and perpendicular to the line through the points (2, 5) and (-3, 6).
18. Find the equation of the lines which cut off intercepts on the axes whose sum and product are 1 and -6 respectively.
19. Write the equation of the line in intercept form.
20. If p and q are lengths of the perpendicular from the origin to the lines $xcos\theta - ysin\theta = kcos2\theta$ and $xsec\theta + ycosec\theta = k$ respectively, then prove that $p^2 + 4q^2 = k^2$.

Chapter 11 *Conic Section* Marks (4)

1. Determine the centre and radius of the circle $x^2 + y^2 - 8x + 10y - 12 = 0$.
2. Find the equation of a parabola in standard form.
3. Prove that the line lx+my+n=0 will touch the circle $x^2+y^2=a^2$ if $a^2(l^2 + m^2) = n^2$.
4. Find the eccentricity, coordinate of foci, length of the major axis and latus rectum of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$.
5. Find the centre and radius of the circle $x^2 + y^2 - 6x + 4y + 8 = 0$. Also find the equation of the tangent to this circle at (1, -3).
6. Find the equation of a parabola in the form $y^2 = 4ax$.
7. Find the equation of the circle passing through the points (0, 1), (1, 0) and (1, 1).
8. Deduce the standard equation of an Ellipse.
9. Find the equation of a circle with centre (2, 2) and passes through the point (4, 5).
10. Find the equation of a parabola in the form $y^2 = 4ax$.

Chapter 12 *Three Dimension* Marks (4)

1. Find the ratio in which the yz-plane divides the line segment joining the points (3, 5, 7) and (-2, 4, 6).
2. The centroid of a triangle is (1, 1, 1) and two of its vertices are (3, 2, 4) and (2, -5, -7). Find the co-ordinate of the third vertex of the triangle.
3. Determine the points which trisect the line segment joining the points (3, 0, 9) and (9, -6, 6).
4. Prove that the three points (-4, 6, 0), (2, 4, 6) and (14, 0, -2) are collinear.
5. Find the coordinates of the centroid of the triangle whose vertices are (x_1, y_1, z_1), (x_2, y_2, z_2) and (x_3, y_3, z_3).
6. Find the coordinate of the point which divides the line segment joining the points (1, -2, 3) and (3, 4, -5) in the ratio 2:3 (a) internally and (b) externally.

Chapter 13 *Limit and Derivatives* Marks (7)

1. Find the limit (i). $\lim_{x\to 2}\frac{x^3-8}{x^2-4}$ (ii). $\lim_{x\to 0}\frac{1-cos2x}{x^2}$
2. $\lim_{x\to 0}\frac{sin5x}{tan7x}=?$
3. Differentiate w.r.t x (i). $x^3 sinx$ (ii). $\frac{2x-1}{x+1}$
4. Find the limit: (i). $\lim_{x\to a}\frac{x-a}{\sqrt{x}-\sqrt{a}}$ (ii). $\lim_{n\to\infty}\frac{1^2+2^2+3^2+\cdots+n^2}{n^3}$

   (iii). $\lim_{x\to 0}\frac{sinx^0}{x}$
5. Find the derivative w.r.t x: (i). $(x+2)^4$ (ii). x^2e^x (iii). $\frac{2x-3}{x^2+1}$ (iv).$xsinx$
6. Find the limit (i). $\lim_{x\to 3}\frac{x^3-27}{x^2-9}$ (ii). $\lim_{x\to 0}\frac{e^x-1}{sin2x}$ (iii). $\lim_{x\to 0}\frac{1-cos2x}{x^2}$

   (iv). $\lim_{x\to 0}\frac{a^x-b^x}{x}$
7. Find the derivative w.r.t x (i). $e^x + xlogx$ (ii). $\frac{x+1}{7x-2}$ (iii). $\sqrt{\frac{1-cosx}{1+cosx}}$

   (iv). $a^x + x^a + ax$
8. Find the limit (i). $\lim_{x\to 3}\frac{\sqrt[3]{x}-\sqrt[3]{3}}{x^2-9}$ (ii). $\lim_{x\to \pi}\frac{sinx}{\pi-x}$ (iii). $\lim_{x\to 3}\frac{1-cosax}{1-cosbx}$

   (iv). $\lim_{n\to\infty}\frac{1}{n^3}[1^2+2^2+3^2+\cdots+n^2]$
9. Find the derivative: (i). $e^x logx$ (ii). $\frac{2x+1}{2x-1}+log2$ (iii). $sinxsin2x$

   (iv). $\log_x x + sec\frac{\pi}{40}$
10. Find the limit of $\lim_{x\to 0}\frac{tanx}{x}$
11. Find the limit of (i). $\lim_{x\to 0}\frac{ax+xcosx}{bsinx}$ (ii). $\lim_{x\to 0}\frac{sin4x}{sin2x}$ (iii). $\lim_{x\to 0}\frac{x^2-4}{x^3-4x^2+4x}$

    (iv). $\lim_{x\to\infty}\frac{1^2+2^2+3^2+\cdots+n^2}{n^3}$

12. Find the derivative of the following w.r.t x:

(i). $\frac{1+\frac{1}{x}}{1-\frac{1}{x}}$ (ii). $\frac{x+cosx}{tanx}$ (iii). $\frac{ax+b}{px^2+qx+r}$ (iv). x^2e^x

Chapter 14 *Mathematical Reasoning* Marks (3)

1. What is meant by a statement? If p and q represent the statement '3> $2'$ and $'7 \neq 4$' respectively, then write statements '*p and q*' and *negation of p.*
2. What is meant by a statement? Write the negation of the statement-'For every real number x, $x^2 \geq 0'$.
3. What is the negation of the statement 'x=y'. Find the truth value of the following-

   (i). '2≠5 and 6< 4' (ii). $'7 > 2$ *or* $5 < 3$'

4. If the truth value of p is true (T) and that of q is false (F), then write the truth values of the following statements:

   (i). '*p or q*'. (ii). '*p and q*'. (iii). '*If p, then q*'.

5. What is the negation of the statement 'x=y'?

6. Find the truth value of the following:

   (i). All prime numbers are either even or odd.

   (ii). $9 > 4$ *or* $5 < 3$.

Chapter 15 *Statistics* Marks (7)

1. Find the mean deviation from the mean of the following data:

Marks obtained	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of students	2	3	8	14	8	3	2

2. Find the standard deviation of the data given below:

x_i	60	61	62	63	64	65	66	67	68
f_i	2	1	12	29	25	12	10	4	5

3. Find the mean deviation from the median of the following data:

Class	0-6	6-12	12-18	18-24	24-30
Frequency	8	10	12	9	5

4. Calculate the S.D. for the following data:

Class	0-10	10-20	20-30	30-40	40-50
Frequency	13	14	27	20	16

5. Find the mean deviation from the mean of the frequency distribution given below:

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	5	7	13	12	8	6

6. For the following frequency distribution, calculate the standard deviation (SD):

Class	0-10	10-20	20-30	30-40	40-50
Frequency	10	12	25	17	9

7. Calculate the standard deviation for the following distribution:

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100

Frequency	3	7	12	15	8	3	2

8. Determine the mean deviation about median for the following distribution:

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of students	6	8	14	16	4	2

9. Write the formula for finding standard deviation of a grouped data.
10. Write the relation between standard deviation and variance.
11. Mention the formula used to find SD.
12. Define mean deviation.
13. Mention the formula used to find SD.
14. Find the mean deviation from the mean of the frequency distribution given below:

Class	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800
Frequency	4	8	9	10	7	5	4	3

15. The mean of 5 observation is 4.4 and their variance is 8.24. If three of the observations are 1, 2 and 6, then find the other two observations.

Chapter 16 *Probability* Marks (5)

1. Mention the probability of an impossible event.
2. Find the probability of getting at most 2 heads in tossing a coin 3-times.
3. What is the probability of the certain event of an experiment.
4. Find the probability of getting a sum of 7 or 8 in throwing a die twice.
5. What is the probability that an ordinary year has 53 Mondays?
6. What is the probability of getting two heads in tossing a coin twice.
7. Find the probability of getting exactly two heads in tossing a fair coin four times.
8. Find the probability of getting an odd difference in throwing a die twice.
9. Find the probability of getting 53 Sundays in a non-leap year?
10. Find the probability of getting at least 5 in a single throw of two dice.
11. For any two events A and B prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.
12. If A, B, C are three events associated with random experiment, then prove that $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$.
13. Three coins are tossed once. Find the probability of getting (a) 2 heads, (b). at least 2 heads, (c) exactly 2 tails, (d) at most 2 tails and (e) no tails.

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