

DEHRADUN PUBLIC SCHOOL
ASSIGNMENT (2022-23)
SUBJECT- APPLIED MATHEMATICS (241)
CLASS - XI

UNIT-I (NUMBERS, QUANTIFICATION AND NUMERICAL APPLICATIONS)

Solve the following questions :-

- Q.1** The sum of binary numbers 101101 and 110010 is
a. 101111 b. 1011111 c. 110111 d. None of these
- Q.2** The value of $(1 + (3^{-3}))^3$ is
a. $\frac{28}{27}$ b. $\left(\frac{28}{27}\right)^3$ c. $\left(\frac{28}{27}\right)^4$ d. None of these
- Q.3** The value of $[2 - 3(2 - 3)^3]^3$ is
a. 5 b. 125 c. $\frac{1}{5}$ d. -125
- Q.4** When simplified $(x^{-1} + y^{-1})^{-1}$ is equal to
a. xy b. x + y c. $\frac{xy}{x + y}$ d. $\frac{x + y}{xy}$
- Q.5** If $\log_2 27 = a$, then $\log_6 16$ is
a. $\frac{3-a}{3+a}$ b. $4\left(\frac{3-a}{3+a}\right)$ c. $3\left(\frac{4-a}{4+a}\right)$ d. None of these
- Q.6** The average of 15 numbers is 42. The sum of these numbers is
a. 600 b. 435 c. 620 d. 630
- Q.7** The area of a triangle is 216 cm² and its sides are in the ratio 3 : 4 : 5. The perimeter of the triangle is
a. 72 cm b. 36 cm c. 12 cm d. 6 cm
- Q.8** The decimal equivalent of $(110101)_2$ is
a. 50 b. 52 c. 51 d. 53
- Q.9** If each side of a rectangle is increased by 50%, its area will increase by
a. 50% b. 125% c. 150% d. 200%
- Q.10** Using log table, the value of $(427)^{\frac{1}{5}}$ is
a. 0.3260 b. 3.260 c. 0.2360 d. 2.360
- Q.11** Suppose that a and b are integers such that $a \equiv 4 \pmod{13}$ and $b \equiv 9 \pmod{13}$. Find $c \in \mathbb{Z}$ ($0 \leq c \leq 12$) such that
i. $c \equiv 9a \pmod{13}$ ii. $c \equiv 11b \pmod{13}$
- Q.12** Convert the following numbers into binary
i. 23 ii. 30
- Q.13** Perform the following binary additions
i. $\begin{array}{r} 10001 \\ - 11101 \\ \hline \end{array}$ ii. $\begin{array}{r} 11011 \\ + 01010 \\ \hline \end{array}$

Q.14 If $\frac{a^n \times 3^2 \times 3^n - 27^n}{3^{3m} \times 2^3} = \frac{1}{27}$, prove that $m - n = 1$

Q.15 Prove that $7 \log \frac{16}{15} + 5 \log \frac{25}{24} + 3 \log \frac{81}{80} = \log 2$

Q.16 If $\frac{\log x}{b-c} = \frac{\log y}{c-a} = \frac{\log z}{a-b}$, prove that $x^{b+c-a} y^{c+a-b} z^{a+b-c} = 1$

Q.17 Find the average of first n natural numbers.

Q.18 The average of a, b and c is 11, average of c, d and e is 17, average of e and f is 22 and average of e and c is 17. Find the average of a, b, c, d, e and f.

Q.19 What was the day of the week on 25th December, 1995?

Q.20 How much does a clock gain per day if its hands coincide every 64 minutes?

Q.21 A clock is set right at 10 am. The clock gains 10 minutes in 24 hours. What will be the true time, when the clock shows 3 pm on the following day?

Q.22 A and B can do a work in 8 days; B and C can do the same work in 12 days. A, B and C together can finish it in 6 days. In how many days A and C together will do the same work ?

Q.23 A man covers a certain distance on a toy train. Had the train moved 4 km / hr faster, it would have taken 30 minutes less. If it moved 2 km/hr slower, it would have taken 20 minutes more. Find the distance.

Case-study based question

Q.24 Prime numbers are fundamental to the RSA algorithm. RSA algorithm is based on the fact that it is easy to multiply two large prime numbers, while it is difficult to do the reverse. Consider the two prime numbers $p = 3, q = 7$.

Based on this answer the following questions:

i. The possible public keys in RSA algorithm are

- | | |
|------------------------------|-------------------------------|
| a. (21, 3), (21, 5), (21, 7) | b. (21, 5), (21, 7), (21, 11) |
| c. (21, 2), (21, 3), (21, 5) | d. (21, 3), (21, 5) |

ii. For encryption key $e = 5$, the decryption key d is

- | | | | |
|------|------|------|------|
| a. 2 | b. 3 | c. 5 | d. 7 |
|------|------|------|------|

iii. For encryption key $e = 7$, and message $p = 8$, the cipher text is

- | | | | |
|--------------------|--------------------|--------------------|--------------------|
| a. $8^7 \pmod{21}$ | b. $7^8 \pmod{21}$ | c. $8^7 \pmod{12}$ | d. $7^8 \pmod{12}$ |
|--------------------|--------------------|--------------------|--------------------|

iv. For encryption key $e = 11$, the private key is

- | | | | |
|------------|------------|-------------|------------|
| a. (21, 5) | b. (21, 7) | c. (21, 11) | d. (21, 3) |
|------------|------------|-------------|------------|

v. For $e = 7$ and cipher text as 8, the plain text is

- | | | | |
|--------------------|--------------------|--------------------|--------------------|
| a. $7^8 \pmod{21}$ | b. $8^7 \pmod{12}$ | c. $7^8 \pmod{12}$ | d. $8^7 \pmod{21}$ |
|--------------------|--------------------|--------------------|--------------------|

UNIT-II (ALGEBRA)

Solve the following questions :-

- Q.1** The number of subsets of a set containing n elements is
a. n b. $2^n - 1$ c. n^2 d. 2^n
- Q.2** If A and B are two sets such that $n(A) = 70$, $n(B) = 60$, $n(A \cup B) = 110$, then $n(A \cap B) =$
a. 240 b. 50 c. 40 d. 20
- Q.3** If A and B are two sets, then $A \cap (A \cup B) =$
a. A b. B c. \emptyset d. $A \cap B$
- Q.4** If R is a relation on the set $A = \{1,2,3,4,5,6,7,8,9\}$ given by $x R y \leftrightarrow y = 3x$, then $R =$
a. $\{(3,1),(6,2),(8,2),(9,3)\}$ b. $\{(3,1),(6,2),(9,3)\}$
c. $\{(3,1),(2,6),(3,9)\}$ d. None of these
- Q.5** If $R = \{(x,y) : x, y \in \mathbb{Z}, x^2 + y^2 \leq 4\}$ is a relation on \mathbb{Z} , then domain of R is
a. $\{0,1,2\}$ b. $\{0,-1,-2\}$ c. $\{-2,-1,0,1,2\}$ d. None of these
- Q.6** Let $n(A) = m$ and $n(B) = n$. Then the total number of non-empty relations that can be defined from A to B is
a. m^n b. $n^m - 1$ c. $mn - 1$ d. $2^{mn} - 1$
- Q.7** If 7th and 13th terms of an A.P. be 34 and 64 respectively, then its 18th term is
a. 87 b. 88 c. 89 d. 90
- Q.8** If the sum of n terms of an A.P. is $3n^2 + 5n$ then which of its term is 164?
a. 26th b. 27th c. 28th d. None of these
- Q.9** The 10th common term between the A.P. 3,7,11,15,..... and 1,6,11,16,..... is
a. 191 b. 193 c. 211 d. None of these
- Q.10** If a, b, c are in A.P. and x, y, z are in G.P., then the value of $x^{b-c} y^{c-a} z^{a-b}$ is
a. 0 b. 1 c. xyz d. $x^a y^b z^c$
- Q.11** The value of $9^{\frac{1}{3}}, 9^{\frac{1}{9}}, 9^{\frac{1}{27}}$ up to infinity is
a. 1 b. 3 c. 9 d. None of these
- Q.12** The two geometric means between the numbers 1 and 64 are
a. 1 and 64 b. 4 and 16 c. 2 and 16 d. 8 and 16
- Q.13** Three numbers form an increasing G.P. If the middle term is doubled, then the new numbers are in A.P. The common ratio of G.P. is
a. $2 + \sqrt{3}$ b. $2 - \sqrt{3}$ c. $2 \pm \sqrt{3}$ d. None of these
- Q.14** The third term of a geometric progression is 4. The product of the first five terms is
a. 4^3 b. 4^5 c. 4^4 d. None of these
- Q.15** In an A.P. if $T_m = n$ and $T_n = m$, then T_{m+n} is
a. 1 b. 0 c. 3 d. 4

- Q.16** The sum of AP 2, 5, 8,up to 50 terms is
a. 3557 b. 3775 c. 3757 d. 3575
- Q.17** If the 3rd of an A.P. is 7 and its 7th term is 2 more than three times of its third term, then the sum of its first 20 terms is
a. 228 b. 74 c. 740 d. 1090
- Q.18** If the sum of the first 2n terms of the A.P. 2, 5, 8,, is equal to the sum of the first n terms of the A.P. 57, 59, 61,, then n equals
a. 10 b. 12 c. 11 d. 15
- Q.19** If an A.P. consists of n terms with first term a and nth term 1, then the sum of mth term from beginning and the mth term from the end is
a. (a+1) b. a-1 c. 2a-1 d. None of these
- Q.20** Describe the following sets in Roster form :
i. { x : x is a letter before e in the English alphabet} ii. {x ∈ R : x > x}
- Q.21** If A and B are two sets such that n(A) = 24, n(B) = 22 and n(A ∩ B) = 8 find
i. n(A ∪ B) ii. n(A - B)
- Q.22** In an examination 56% of the candidates failed in English and 48% failed in science. If 18% failed in both English and science find the percentage of those who passed in both the subjects.
- Q.23** A college awarded 38 medals in football, 15 in basketball and 20 in cricket. In these medals went to a total of 58 men and only 3 men got medals in all the three sports, how many received medals in exactly two of the three sports?
- Q.24** Write the following as intervals : i. {x : x ∈ R, -4 < x ≤ 6} ii. {x : x ∈ R, -12 < x < -10}
- Q.25** If a ∈ {-1,2,3,4,5} and b ∈ {4,6,18,27}, then form the set of all ordered pairs (a, b) such that a divides b and a < b.
- Q.26** Let R be the relation on Z defined by R = {(a, b): a, b ∈ Z, a - b is an integer}. Find the domain and range of R.
- Q.27** Let R = {x, y): |x² - y²| < 1} be a relation on set A = {1, 2, 3, 4, 5}. Write R as a set of ordered pairs.
- Q.28** Show that the sequence log a, log (ab), log (ab²), log (ab³), ... is an A.P. Find its nth term.
- Q.29** Which term of the sequence 20, 19 $\frac{1}{4}$, 18 $\frac{1}{2}$, 17 $\frac{3}{4}$, is the first negative term?
- Q.30** The product of three numbers in A.P. is 224, and the largest number is 7 time the smallest, find the numbers.
- Q.31** Prove that a sequence is an A.P., if the sum of its n terms is of the form An² + Bn, where A, B are constants.
- Q.32** The sum of three numbers in G.P. is 56. If we subtract 1, 7, 21 from these numbers in that order, we obtain an arithmetic progression. Find the numbers.

Q.33 Find the sum of the series : $x(x+y) + x^2(x^2+y^2) + x^3(x^3+y^3) + \dots$ to n terms.

Q.34 If S_1, S_2 and S_3 be respectively the sum of $n, 2n$ and $3n$ terms of a G.P., prove that
 $S_1(S_3 - S_2) = (S_2 - S_1)^2$

Q.35 Prove that: $n!(n+2) = n! + (n+1)!$

Q.36 Prove that: $\frac{(2n+1)!}{n!} = 2^n \{1.3.5 \dots (2n-1)(2n+1)\}$

Q.37 A gentleman has 6 friends to invite. In how many ways can he send invitation cards to them, if he has three servants to carry the cards?

Q.38 How many numbers are there between 100 and 1000 such that at least one of their digits is 7?

Q.39 If ${}^{n+2}C_8 : {}^{n-2}P_4 = 57 : 16$, find n .

Q.40 If ${}^nP_r = {}^nP_{r+1}$ and ${}^nC_r = {}^nC_{r-1}$, find the values of n and r .

Q.41 From 4 Officers and 8 Jawans in how many ways can 6 be chosen
 i. to include exactly one Officer ii. to include at least one Officer

Q.42 Eighteen guests have to be seated, half on each side of a long table. Four particular guests desire to sit on one particular side and three others on the other side. Determine the number of ways in which the seating arrangement can be made.

Q.43 The first, second and the last term of an A.P. are a, b, c respectively. Prove that the sum is

$$\frac{(a+c)(b+c-2a)}{2(b-a)}$$

Q.44 Find four numbers in A.P. whose sum is 20 and the sum of whose squares is 120.

Q.45 Evaluate: ${}^{12}P_4 \cdot {}^6P_3$

Q.46 If ${}^{56}P_{r+6} : {}^{54}P_{r+3} = 30800 : 1$, find r .

Case-study based question

Q.47 Neha is doing a designing course. She is working on Cartesian Art now a days. For it she wants to take x-coordinate from set $A = \{0,1,2,3,5\}$ and y-coordinate from the set $B = \{-3,-2,-1,0,1,2,3\}$.

Based on this answer the following questions:

- i. How many ordered pairs Neha can make from A to B?
 a. 25 b. 30 c. 35 d. 40

- ii. How many ordered pairs Neha can make from B to A?
 a. 25 b. 30 c. 35 d. 40

- iii. If a relation A to B is defined as $R = \{(a, b) : a < b ; a \in A, b \in B\}$, then how many elements are there in R?
 a. 6 b. 8 c. 12 d. 20

iv. How many total relation can be defined from set A to set B?

- a. 2^5 b. 2^7 c. 2^{12} d. 2^{35}

v. The domain of R is

- a. $\{0,1,2,3\}$ b. $\{0,1,2\}$ c. $\{0,1,2,3,5\}$ d. $\{0,1\}$

UNIT-III (MATHEMATICAL REASONING)

Solve the following questions :-

- Q.1** The connective in the statement $2 + 7 > 9$ or $2 + 7 < 9$ is
a. and b. or c. $>$ d. $<$
- Q.2** Which of the following is not a negation of the statement A natural number is greater than zero?
a. A natural number is not greater than zero
b. It is false that a natural number is greater than zero
c. It is false that a natural number is not greater than zero
d. None of these
- Q.3** Which of the following is a statement?
a. x is a real number b. Switch of the fan c. 6 is a natural number d. Let me go
- Q.4** The contra-positive of the statement If a triangle is not equilateral, it is not isosceles is
a. If a triangle is not equilateral, it is not isosceles
b. If a triangle is equilateral, it is not isosceles
c. If a triangle is not equilateral, it is isosceles
d. If a triangle is equilateral, it is isosceles
- Q.5** Which of the following is a statement?
a. I will go tomorrow b. She will come today
c. 3 is a prime number d. Tomorrow is Friday
- Q.6** The contra-positive of the statement if p then q is
a. If $\sim p$ then q b. If p then $\sim q$ c. If q then p d. If $\sim q$ then $\sim p$
- Q.7** Which of the following is not a statement?
a. The product of (-1) and 8 is 8 b. All complex number are real number
c. Today is windy day d. All of the above
- Q.8** If (p or q) is true, then
a. p is true and q is false b. p is true and q is true
c. p is false and q is true d. All of the above
- Q.9** Which of the following statement is a conjunction?
a. Ram and Shyam are friends b. Both Ram and Shyam are friends
c. Both Ram and Shyam are enemies d. None of these
- Q.10** Which of the following is a compound statement?
a. Sun is a star b. I am a very strong boy
c. There is something wrong in the room d. 7 is both odd and prime number
- Q.11** If (p and q) is false then
a. p is true and q is false b. p is false and q is false
c. p is false and q is true d. All of the above

- Q.12** The converse of the statement $p \Rightarrow q$ is
 a. $p \Rightarrow q$ b. $q \Rightarrow p$ c. $\sim p \Rightarrow q$ d. $\sim q \Rightarrow p$
- Q.13** The negation of the statement, the product of 3 and 4 is 9 is
 a. It is false that the product of 3 and 4 is 9 b. The product of 3 and 4 is 12
 c. The product of 3 and 4 is not 12 d. It is false that the product of 3 and 4 is not 9
- Q.14** Sentence involving variable time such as today, tomorrow, or yesterday are
 a. Statements b. Not statements c. May or may not be statements d. None of these
- Q.15** Which of the following is the conditional $p \rightarrow q$?
 a. q is sufficient for p b. p is necessary for q c. p only if q d. If q then p
- Q.16** State the truth value of each of the following statements
 i. A triangle one of whose vertices lies on a circle and whose side opposite to this vertex is a diameter of the circle is a right angled triangle.
 ii. There is always a real root of any quadratic equation.
 iii. The number of ways of seating 2 persons in two chairs out of n persons is $P(n, 2)$.
 iv. A quadratic equation whose coefficients are odd integers has irrational roots.
- Q.17** Write the truth value of the following statements:
 i. $x^2 + |x| + 4 = 0$ has at least one real root. ii. Every real number is a complex number.
 iii. $\sin^{-1}\left(\frac{2x}{1+x^2}\right) = 2 \tan^{-1} x$ for all $x \in R$.
- Q.18** In a certain code MADRAS is written as NBESBT. How is BOMBAY written in that code?
- Q.19** Find the odd one out A, E, D, H, G.
- Q.20** Find the odd one out : RO, KH, IF, NL, GD.
- Q.21** Rajnish said to Manish, "That boy playing cricket is the younger of the two brothers of the daughter of my father's wife". How is the boy playing cricket related to Rajnish?
- Q.22** A woman going with a boy is asked by another woman about the relationship between them. The woman replied, "my maternal uncle and the uncle of his maternal uncle is the same". How is the lady related with that boy?
- Q.23** Find the odd one out: Square, Triangle, Rectangle, Circle, Cuboid.

UNIT-4 (CALCULUS)

Solve the following questions :-

- Q.1** The domain of the function f defined by $f(x) = \sqrt{a^2 - x^2}$ ($a > 0$) is
 a. $(-a, a)$ b. $[-a, a]$ c. $[0, a]$ d. $(-a, 0]$
- Q.2** Let A be a finite set containing 3 elements, then the number of functions from A to A is
 a. 512 b. 511 c. 27 d. 26

- Q.3** The domain and range of the real function f defined by $f(x) = \frac{x-2}{2-x}$ is
- a. Domain= $\mathbb{R} - \{2\}$, Range = $\{-1\}$ b. Domain = $\mathbb{R} - \{-2\}$, Range= $\{-1\}$
c. Domain= $\mathbb{R} - \{2\}$, Range = $\{1\}$ d. Domain= $\mathbb{R} - \{2\}$, Range= $\{1\}$
- Q.4** Find the domain of the function $f(x) = \frac{x^2 + 3x + 5}{x^2 - 5x + 4}$
- a. $\mathbb{R} - \{1, 4\}$ b. $\{1, 4\}$ c. $\{-1, -4\}$ d. None of these
- Q.5** The domain for which the functions defined by $f(x) = 3x^2 - 1$ and $g(x) = 3 + x$ are equal to
- a. $\left\{-1, \frac{4}{3}\right\}$ b. $\left\{-1, -\frac{4}{3}\right\}$ c. $\left\{1, \frac{4}{3}\right\}$ d. None of these
- Q.6** If $f(x) = \frac{1}{2 - \sin 3x}$, then range (f) is equal to
- a. $[-1, 1]$ b. $\left[-\frac{1}{3}, \frac{1}{3}\right]$ c. $\left[\frac{1}{3}, 1\right]$ d. None of these
- Q.7** Two functions f and g are said to be equal if f
- a. The domain of f = the domain of g b. The co-domain of f = the co-domain of g
c. $f(x) = g(x)$ for all x d. All of above
- Q.8** A function $f(x)$ is said to be an odd function if
- a. $f(-x) = f(x)$ b. $f(-x) = -f(x)$ c. $f(-x) = k * f(x)$ where k is a constant d. None of these
- Q.9** The domain of the function $f(x) = \frac{1}{(x^2 - 3x + 2)}$ is
- a. $\{1, 2\}$ b. \mathbb{R} c. $\mathbb{R} - \{1, 2\}$ d. None of these
- Q.10** Find the domain of the function $f(x)$ defined by $f(x) = \frac{x^2 + 3x + 5}{x^2 - 5x + 4}$
- Q.11** Find the domain of the function $f(x)$ defined by $f(x) = \sqrt{4-x} + \frac{1}{\sqrt{x^2-1}}$
- Q.12** Find the domain and range of the function $f(x) = \frac{1}{\sqrt{x-(x)}}$
- Q.13** Evaluate the left hand and right hand limits of the function defined by
- $$f(x) = \begin{cases} 1+x^2 & \text{if } 0 \leq x \leq 1 \\ 2-x & \text{if } x > 1 \end{cases} \quad \text{at } x = 1.$$
- Q.14** Find the left hand and right had limits of the greatest integer function $f(x) = \{x\} =$ greatest integer less than or equal to x , at $x = k$, where k is an integer. Also, show that $\lim_{x \rightarrow k} f(x)$ does not exist.
- Q.15** Evaluate: $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} + \sqrt{1-x}}{1+x}$
- Q.16** Evaluate: $\lim_{x \rightarrow 2} \frac{x^2 - 4}{\sqrt{3x-2} - \sqrt{x+2}}$
- Q.17** Discuss the continuity of the function of given by $f(x) = |x-1| + |x+2|$ at $x = 1$ and $x = 2$.
- Q.18** Find the value of p so that $f(x)$ is continuous

$$f(x) = \begin{cases} \frac{\sqrt{1+px} - \sqrt{1-px}}{x}, & \text{if } -\leq x < 0 \\ \frac{2x+1}{x-5}, & \text{if } 0 \leq x \leq 1 \end{cases}$$

Q.19 If $f(x) = mx + c$ and $f(0) = f'(0) = 1$. What is $f(2)$?

Q.20 Differentiate the following functions with respect to x :

i. e^{e^x} ii. $\log_7(\log_7 x)$

Q.21 If $y = \left\{x + \sqrt{x^2 + a^2}\right\}^n$, then prove that $\frac{dy}{dx} = \frac{ny}{\sqrt{x^2 + a^2}}$

Q.22 If $x^2 + 2xy + y^3 = 42$, find $\frac{dy}{dx}$

Q.23 If $x^m y^n = (x + y)^{m+n}$, prove that $\frac{dy}{dx} = \frac{y}{x}$

Q.24 Find the point on the curve $y = 2x^2 - 6x - 4$ at which the tangent is parallel to the x - axis.

Q.25 Find a point on the curve $y = (x - 3)^2$, where the tangent is parallel to the line joining $(4, 1)$ and $(3, 0)$.

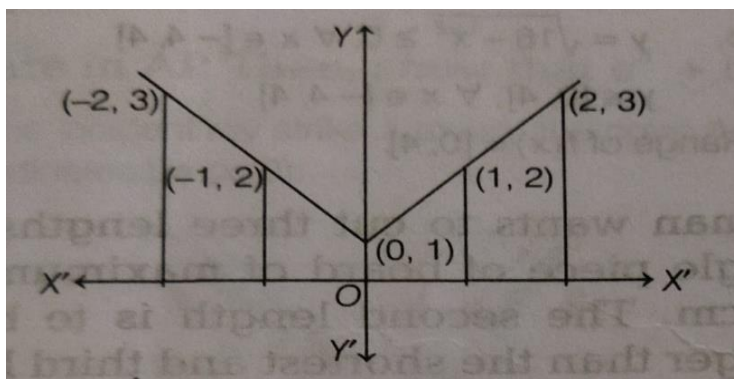
Q.26 Find the equation of tangent line to $y = 2x^2 + 7$ which is parallel to the line $4x - y + 3 = 0$

Q.27 Find the equation of the tangents to the curve $3x^2 - y^2 = 8$, which passes through the point $(4/3, 0)$.

Q.28 Find the equations of all lines of slope zero and that are tangent to the curve $y = \frac{1}{x^2 - 2x + 3}$

Case-study based question

Q.29 The figure, show a graph of curve $y = f(x)$



Based on the above information answer the following

i. The graph of $f(x)$ is

- a. $|x - 1|$ b. $|x + 1|$ c. $1 + |x|$ d. $1 - |x|$

ii. Domain of $f(x)$ is

- a. $(0, \infty)$ b. $(-\infty, \infty)$ c. $(-\infty, 0)$ d. None of these

iii. Range of $f(x)$ is

- a. \mathbb{R} b. $\mathbb{R} - \{1\}$ c. (\emptyset, ∞) d. None of these

iv. The value of $f(1)$ is

- a. 2 b. 3 c. 4 d. 5

v. The value of $f(-2)$ is

a. 0

b. 3

c. 1

d. 4

UNIT-V (PROBABILITY)

Solve the following questions :-

- Q.1** If A and B are two independent events, then
a. $P(A \cap B) = P(A) \times P(B)$
b. $P(AB) = 1 - P(A') P(B')$
c. $P(AB) = 1 + P(A') P(B') P(A')$
d. $P(AB) = P(A') P(B')$
- Q.2** If $P(A) = 3/8$, $P(B) = 1/3$ and $P(A \cap B) = 1/4$, then $P(A' \cap B')$ is
a. $13/24$ b. $13/8$ c. $13/9$ d. $13/4$
- Q.3** If A and B are two events such that $P(A) \neq 0$ and $P(AB) = 1$, then
a. $B \subset A$ b. $B = \phi$ c. $A \subset B$ d. $A \cap B = \phi$
- Q.4** The chance of getting a doublet with 2 dice is
a. $2/3$ b. $1/6$ c. $5/6$ d. $5/36$
- Q.5** A coin is tossed twice. Then, the probability that atleast one tail occurs is
a. $1/4$ b. $1/2$ c. $1/3$ d. $3/4$
- Q.6** A card is drawn from an ordinary pack of 52 cards and a gambler bets that, it is a spade or an ace. The odds against his winning this bet is
a. 4:9 b. 9:4 c. 3:8 d. 8:3
- Q.7** A coin is tossed twice. If the second draw results in a head, a die is rolled. Write the sample space for this experiment.
- Q.8** A coin is tossed. If head comes up, a die is thrown but if tail comes up, the coin is tossed again. Find the probability of obtaining:
i. two tails ii. head and number 6 iii. head and an even number
- Q.9** If E and F are two events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$, find
i. $P(E \text{ or } F)$ ii. $P(\text{not } E \text{ and not } F)$
- Q.10** A die is thrown twice and the sum of the numbers appearing is observed to be 6. What is the probability that the number 4 has appeared at least once?
- Q.11** Two cards are drawn from a pack of 52 cards. What is the probability that either both are red or both are kings?
- Q.12** The probability that a person will get an electric contract is $\frac{2}{5}$ and the probability that he will not get plumbing contract is $\frac{4}{7}$. If the probability of getting at least one contract is $\frac{2}{3}$, what is the probability that he will get both ?
- Q.13** Three coins are tossed. Consider the events : E = Three heads or three tails, F = At least two heads and G = At most two heads. Of the pairs (E, F), (E, G) and (F, G) which are independent? Which are dependent?
- Q.14** One bag contains 4 white and 5 black balls. Another bag contains 6 white and 7 black balls. A ball is transferred from first bag to the second bag and then a ball is drawn from the second bag. Find the probability that the ball drawn is white.

- Q.15** Two thirds of the students in a class are boys and the rest girls. It is known that the probability of a girl getting a first class is 0.25 and that of a boy getting a first class is 0.28. Find the probability that a student chosen at random will get first class marks in the subject.
- Q.16** A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

Case-study based question

- Q.17** In answering a question on a multiple choice test for class XII, a student either knows the answer or guesses. Let $\frac{3}{5}$ be the probability that he knows the answer and $\frac{2}{5}$ be the probability that he guesses. Assume that a student who guesses at the answer will be correct with probability $\frac{1}{3}$. Let E_1, E_2, E be the events that the student knows the answer, guesses the answers and the answers correctly respectively.



Answer the following questions using the above information.

- i. The value of $P(E_1)$ is
- a. $\frac{2}{5}$ b. $\frac{1}{3}$ c. 1 d. $\frac{3}{5}$
- ii. The value of $P(E/E_1)$ is
- a. $\frac{1}{3}$ b. $\frac{2}{3}$ c. 1 d. 2
- iii. What is the probability that the student knows the answer given that he answered it correctly?
- a. $\frac{2}{11}$ b. $\frac{9}{11}$ c. $\frac{13}{3}$ d. $\frac{5}{3}$
- iv. Value of $\sum_{K=1}^{K=2} P(E_K)$ is
- a. $\frac{1}{3}$ b. $\frac{1}{5}$ c. 1 d. $\frac{3}{5}$

UNIT-VI (DESCRIPTIVE STATISTICS)

Solve the following questions :-

- Q.1** Tally marks are used to find
- a. Class intervals b. Range c. Frequency d. Upper limits
- Q.2** The mid value of the class interval is 42. If the class size is 10, then the upper and lower limits of the class are
- a. 47, 37 b. 37, 47 c. 37.5, 47.5 d. 47.5, 37.5
- Q.3** If v is the variance and σ is the standard deviation, then
- a. $v = \frac{1}{\sigma}$ b. $v = \frac{1}{\sigma^2}$ c. $v = \sigma^2$ d. $v^2 = \sigma$

- Q.4** The mean deviation from the median is
 a. To that measured from another value
 b. Maximum if all observations are positive
 c. Greater than that measured from any other value
 d. Less than that measured from any other value
- Q.5** The coefficient of skewness based upon quartiles is
 a. Karl Pearson's coefficient b. Bowley's coefficient
 c. Kelly's coefficient d. Spearman's coefficient
- Q.6** The Quartile coefficient of skewness is negative, if
 a. $Q_3+Q_1>2 \text{ Median}$ b. $Q_3+Q_1<2 \text{ Median}$ c. $Q_3+Q_1=2 \text{ Median}$ d. $Q_3+Q_1>\text{Median}$
- Q.7** The Variance of first five natural numbers is
 a. 1 b. 2 c. 3 d. 4
- Q.8** Which of the following is a branch of statistics?
 a. Descriptive statistics b. Inferential statistics c. Industry statistics d. Both a and b
- Q.9** Specialized processes such as graphical and numerical methods are utilized in which of the following?
 a. Education statistics b. Descriptive statistics c. Business statistics d. Social statistics
- Q.10** Which of the following values is used as a summary measure for a sample, such as a sample mean?
 a. Population parameter b. Sample parameter c. Sample statistic d. Population mean

Q.11 For the following data, draw a histogram and a frequency ploygon :

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	5	10	4	6	7	3	2	2	3	9

Q.12 Draw an ogive and the cumulative frequency polygon for the following frequency distribution by less than method.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of students	7	10	23	51	6	3

Q.13 The mean of 100 items was found to be 30. If at the time of calculation two items were wrongly taken as 32 and 12 instead of 23 and 11, find the correct mean.

Q.14 Find the coefficient of variation for the following data:

Size (in cm)	10-15	15-20	20-25	25-30	30-35	35-40
No. of items	2	8	20	35	20	15

Q.15 Compute 70th and 90th percentile from the following data :

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	5	7	10	16	7	5	4	3	4	2

Q.16 For a group of 20 items, $\sum x_i = 1452$, $\sum x_i^2 = 144280$ and mode = 63.7. Find Pearson's coefficient of skewness.

Q.17 Find the Karl Pearson's coefficient of correlation between X and Y for the data:

X	6	2	4	9	1	3	5	8
Y	13	8	12	15	9	10	11	16

Q.18 The marks obtained by nine students in Physics and Mathematics are given below:

Marks in Physics	35	23	47	17	10	43	9	6	28
Marks in Mathematics	30	33	45	23	8	49	12	4	31

Compute their ranks in the two subjects and the coefficient of correlation of ranks.

Case-study based question

Q.19. One of the best measures of variability, which is independent of units is called Karl Pearson's coefficient of variation and it is defined as $C.V. = \frac{s}{x} \times 100$

Where s is the standard deviation and x is the mean of given distribution.

For comparing the variability or dispersion of two series, we calculate the coefficient of variation of each series. The series having higher C.V. is called more variable than the other, while the series having lesser C.V. is called more consistent or more stable.

A panel of two judges P and Q graded seven dramatic performances by independently awarding marks as follows:

Performance	1	2	3	4	5	6	7
Marks by P	46	42	44	40	43	41	45
Marks by Q	40	38	36	35	39	37	41

Based on the above information, answer the following questions:

- Mean of marks given by judge P is
 - 44
 - 43
 - 42
 - 41
- Mean of marks given by judge Q is
 - 38
 - 39
 - 37
 - 40
- Standard deviation of marks given by judge P is
 - 2.5
 - 2.3
 - 2.1
 - 2
- Standard deviation of marks given by judge Q is
 - 3
 - 2.5
 - 2
 - 1.9
- What predictions can be made about judge P using coefficient of variation?
 - more liberal, less consistent
 - less liberal, more consistent
 - less liberal, less consistent
 - more liberal, more consistent

UNIT-VII (BASICS OF FINANCIAL MATHEMATICS)

Solve the following questions :-

- Which of the following tax was abolished by GST?
 - Wealth Tax
 - Service Tax
 - Corporation Tax
 - Income Tax
- The sum of all payments made and the compound interest earned on these payments at the end of the term is called
 - Future value
 - Present value
 - Net present value
 - Periodic payment
- The time limit to pay the value of supply with taxes is
 - 4 months
 - 3 months
 - 10 months
 - 180 days
- Taxes that are levied on any intra-state purchase rate are
 - SGST
 - IGST
 - CGST and SGST
 - None of these

- Q.5** The maximum rate of CGST is
 a. 20% b. 17% c. 24% d. 14%
- Q.6** A sum amounts to Rs. 1352 in 2 years at 4% compound interest. The sum is
 a. Rs. 1250 b. Rs. 1200 c. Rs. 1300 d. Rs. 1260
- Q.7** The effective rate of return, which is equivalent to a declared rate of 6% compounded semi-annually is
 a. 6.5% b. 6.05% c. 6.09% d. 6.9%
- Q.8** At what rate percent per annum simple interest will a sum of money triple itself in 25 years?
 a. 9.5% b. 8% c. 10% d. 8.5%
- Q.9** The amount of an ordinary annuity of Rs. 1500 at the end of each year for 3 years at 10% per year compounded annually, is
 a. Rs. 5132 b. Rs. 4965 c. Rs. 3743 d. Rs. 6354
- Q.10** Divide Rs. 15,500 into two parts such that if one part be lent out at 15% per annum and the other at 24% per annum, the total annual income is Rs. 3,000.
- Q.11** Find the compound interest at the rate of 10% per annum for four years on the principal which in four years at the rate of 4% per annum gives Rs. 1600 as simple interest.
- Q.12** Amine can be purchased by paying Rs. 6,00,000 now or Rs. 2,00,000 initially and two installments of Rs. 3,00,000 at the end of second year and Rs. 1,90,000 at the end of 4th year respectively. To pay cash now, the buyer would have to withdraw the money from an investment earning interest at 8% compounded annually. Which option is better and by how much in present value terms?
- Q.13** The initial investment in a project is Rs. 10,00,000. If the project generates cash inflows of Rs. 5,00,000, Rs. 3,00,000 and Rs. 8,00,000 in first, second and third years respectively. Assume that there is no salvage value at the end of third year and the required rate of return is 8% per annum. Find the net present value of the project.
- Q.14** Find the amount of an annuity of Rs. 500 payable at the end of each year for 14 years if money is worth 5% compounded annually.
- Q.15** A manufacturer sells a refrigerator to a dealer for Rs. 45,000. The dealer sells it to a customer at a profit of Rs. 4600. If the sales are intra – state and the rate of GST is 12%, find the amount
 i. of GST paid by the dealer to the state and central governments.
 ii. of total GST received by the state and central governments
 iii. paid by the customer to the dealer
- Q.16** A shopkeeper has marked Rs. 7840 as the price of an article including 12% GST on the listed price. A buyer asks for a discount on the listed price so that after charging GST, the selling price becomes equal to the listed price. Find the amount discount the shopkeeper has to offer for the deal.

Case-study based question

- Q.17** A project requires an initial investment of Rs. 250000 and is expected to generate the following net cash inflows year-1: Rs. 98000, year-2: Rs. 120000, year-3: Rs. 150000. The discount rate is 12% per annum.
 Based on the above information, answer the following questions-
- i. The present value of cash inflow expected to generate at the end of year-1 is
 a. Rs. 87500 b. Rs. 76100 c. Rs. 82540 d. Rs. 92640

- ii. The present value of cash inflow expected to generate at the end of year-2 is
 a. Rs. 90106 b. Rs. 94350 c. Rs. 95676 d. Rs. 97520
- iii. The present value of cash inflow expected to generate at the end of year-3 is
 a. Rs. 100524 b. Rs. 106785 c. Rs. 110321 d. Rs. 995432
- iv. The net present value of the investment is
 a. Rs. 289961 b. Rs. 150672 c. Rs. 310514 d. Rs. 413539
- v. The difference between the net present value and the present value of cash outflow is
 a. Rs. 56429 b. Rs. 42516 c. Rs. 35628 d. Rs. 39961

UNIT-VIII (COORDINATE GEOMETRY)

Solve the following questions :-

- Q.1** The angle between the lines $x - 2y = 5$ and $y - 2x = 5$ is
 a. $\tan^{-1} \frac{1}{4}$ b. $\tan^{-1} \frac{3}{5}$ c. $\tan^{-1} \frac{5}{4}$ d. None of these
- Q.2** The locus of the point from which the tangent to the circles $x^2 + y^2 - 4 = 0$ and $x^2 + y^2 - 8x + 15 = 0$ are equal is given by the equation
 a. $8x + 19 = 0$ b. $8x - 19 = 0$ c. $4x - 19 = 0$ d. $4x + 19 = 0$
- Q.3** The parametric coordinate of any point of the parabola $y^2 = 4ax$ is
 a. $(-at^2, -2at)$ b. $(-at^2, 2at)$ c. $(a \sin^2 t, -2a \sin t)$ d. $(a \sin t, -2a \sin t)$
- Q.4** The equation of X-axis is
 a. $x = 0$ b. $y = 0$ c. $x + y = 0$ d. $x - y = 0$
- Q.5** If the price elasticity of demand is zero, then shape of the curve will be
 a. horizontal b. vertical c. slopping downward d. None of these
- Q.6** If A $(-2, 1)$, B $(2, 3)$ and C $(-2, -4)$ are three points, find the angle between BA and BC.
- Q.7** Find the equation of a straight line which cuts off an intercept of 5 units on negative direction of y - axis and makes an angle of 120° with the positive direction of x - axis.
- Q.8** Find the equation of a line which divides the join of $(1, 0)$ and $(3, 0)$ in the ratio 2:1 and perpendicular to it.
- Q.9** Find the equations of the altitudes of the triangle whose vertices are A $(7, -1)$, B $(-2, 8)$ and C $(1, 2)$.
- Q.10** A straight line passes through the point (α, β) and this point bisects the portion of the line intercepted between the axes. Show that the equation of the straight line is $\frac{x}{2\alpha} + \frac{y}{2\beta} = 1$.
- Q.11** Find the equation of the straight line upon which the length of perpendicular from origin is $3\sqrt{2}$ units and this perpendicular makes an angle of 75° with the positive direction of x - axis.
- Q.12** Find the value of m for which the lines $mx + (2m + 3)y + m + 6 = 0$ and $(2m + 1)x + (m - 1)y + m - 9 = 0$ intersect at a point on y - axis.
- Q.13** Find the tangent of the angle between the lines whose intercepts on the axes are respectively a, -b and b, -a.

- Q.14** Two sides of a square lie on the lines $x + y = 1$ and $x + y + 2 = 0$. What is its area?
- Q.15** Find the equation of the circle which passes through the origin and cuts off intercepts 3 and 4 from the positive parts of the axes respectively.
- Q.16** Find the equation of the circle concentric with the circle $2x^2 + 2y^2 + 8x + 10y - 39 = 0$ and having its area equal to 16π square units.
- Q.17** Find the equation of the parabola whose focus is the point $(0, 0)$ and whose directrix is the straight line $3x - 4y + 2 = 0$
- Q.18** At what point of the parabola $x^2 = 9y$ is the abscissa three times that of ordinate?
- Q.19** Find the centre and radius of the circle given by the equation $2x^2 + 2y^2 + 3x + 4y + \frac{9}{8} = 0$
- Q.20** Find the equation of the circle which passes through the points $(5, -8)$, $(2, -9)$ and $(2, 1)$. Find also the coordinates of its centre and radius.

Case-study based question

- Q.21** Three girls, Rani, Mansi, Sneha are talking to each other and maintaining a social distance for due to covid-19. They stand on the vertices of a triangle, whose coordinates are Rani $(2, -2)$, Mansi $(1, 1)$ and Sneha $(-1, 0)$.
Based on the above information answer the following
- i. The equation of lines formed by Rani and Mansi is
- a. $3x - y = 4$ b. $3x + y = 4$ c. $x - 3y = 4$ d. $x + 3y = 4$
- ii. Slope of equation of the line formed by Rani and Sneha is
- a. $\frac{2}{3}$ b. $\frac{-3}{2}$ c. $\frac{-2}{3}$ d. $\frac{1}{3}$
- iii. The equation of median of lines through Rani is
- a. $5x + 4y = 2$ b. $5x - 4y = 2$ c. $4x - 5y = 1$ d. None of these
- iv. The equation of altitude through Mansi is
- a. $3x - 2y = 1$ b. $2x + 3y = 5$ c. $x + 2y = 3$ d. None of these
- v. The equation of line passing through Rani and parallel to line formed by Mansi and Sneha is
- a. $x - 2y = 4$ b. $x + 2y = 6$ c. $x - 2y = 3$ d. None of these