SAINIK SCHOOL IMPHAL

SUMMER VACATION

2024-25

ASSIGNMENT/PROJECTS

CLASS XI

MATHEMATICS

SAINIK SCHOOL IMPHAL

SUMMER VACATION H/W

CHAPTER 1 : SETS

SECTION-I (1MARK EACH)

Short Answer Type

1.Given that N=$\{1,2,3, \ldots..100\}$then write the subset B of N, whose elements are represented by $x+2, where\ x \in N$

2.Sets A and B have 3 and 6 elements respectively. What can be the minimum number of elements in (A∪ B)?

3.Rewrite the set A =$\{(x,y)/\ x = 2y, x, y \in N\ and\ y \leq 4\}$ in tabular form.

4. Is it true that for any sets A and B, P(AUB) = P(AUB) ? Justify your answer.

5. Show that A∩B = A∩C need implies B = C.

6. If A = ∅ , then find the number of elements in P(A).

7. Write the set $A = \{x / x^2 - x - 6 = 0\ and\ x \in N\}$ in tabular form.

MCQ Type

1. Let A and B be two non empty sets in the same universal set. Then A−B is equal to
   (a) A∩B (b)A′∩B (c) A∩B′ (d) none of these
2. If A={1,2,3,4,5}, then the number of proper subsets of A is
   (a) 120 (b) 30 (c) 31 (d) 32

3. If A={2,3}, B={4,5}, C={5,6}, then what is the number of elements in A x (B ∩ C)?**(2010-II)**

   (a) 2 (b) 4 (c) 6 (d) 8

4. If set A and B are defined as $A = \{(x,y) \mid y = e^x, x \in R\}, B = \{(x,y) \mid y = x,\ x \in R\}$, then

   (a)$B \subset A$ (b) $A \subset B$ (c)$A \cap B = \emptyset$ (d) $A \cup B = A$

5. Let N be the set of natural numbers and $A = \{n^2 | n \in N\}$ and $B = \{n^3 | n \in N\}$. Which of the following is correct?(2010-II)

   (a)$A \cup B = N$ (b) $A \cap B$must be a finite set.

   (c) The complement of $A \cup B$is an infinite set.

   (d) $A \cap B$must be a proper subset of $\{m^6 | m \in N\}$.

6.If A, B, C are three sets, then what is $A - (B - C)$ equal to?(2008-II)

   (a)$A - (B \cap C)$ (b) $(A - B) \cup C$

   (c) $(A - B) \cup (A \cap C)$ (d) (A-B)∪ $(A - C)$

7. If $A = \{a, b, c, d\}$then what is number of proper subset of A?**(2010-I)**

(a) 16 (b) 15 (c) 14 (d) 12

8. If $n(A) = 115,\ n(B) = 326,\ \ n(A - B) = 47,$ then what is $n(A \cup B)$?

(a) 373 (b) 165 (c) 370 (d) 394

9. If $A\&B$ are two subset of a set X, then what is $A \cap (A \cup B)'$?**(2008-II)**

(a) A (b) B (c) $\emptyset$ (d) A'

10. If X & Y are any two non – empty sets then what is $(X - Y)'$ equals to?**(2009-I)**

(a) $X' - Y'$ (b) $X' \cap Y'$ (c) $X' \cup Y$ (c) $X - Y'$

11. If a set A contains 4 elements, then what is the number of elements in $A \times p(A)$?**(2008-II)**

(a) 16 (b) 32 (c) 64 (d) 128

12. If A & B are two sets, then $A \cap (A \cup B)$ is equal to

(a) A (b) B (c) $\emptyset$ (d) none of these

13. Let X be the universal set for sets A & B. If $n(A) = 200, n(B) = 300$ & $n(A \cap B) = 100$, then $n(A' \cap B')$ is equal to 300 provided $n(X)$ is equal to

(a) 600 (b) 700 (c) 800 (d) 900

14. If $n(A) = 4$ and, $n(B) = 7$ then the min^m and max^m value of $n\ (A \cup B)$respectively.

(a) 4, 11 (b) 4, 7 (c)7, 11 (d) none of these

15. If *A, B, C* are three sets and U is the universal set such that $n(U) = 700$, $n(A) = 200$, $n(B) = 300$ and $n(A \cap B) = 100$ then what is the value of $n(A' \cap B')$?

(a) 100 (b) 200 (c) 300 (d) 400

16. If *A*&*B* are two sets, then $(A-B)\cup(B-A)\cup(A\cap B)$is equal to

(a) $A \cup B$ (b) $A \cap B$ (c) *A* (d) B'

17. If A and B are two sets satisfying A-B = B-A, then which one of the following is correct? **(2007-II)**

(a)$A = \emptyset$ (b) $A \cap B = \emptyset$ (c) $A = B$ (d)none of these

18. If A and B are two subsets of set X, then what is the value of $A \cap (A \cup B)'$?

(a) A (b) B (c) ϕ (d) A'

19. If A & B are subsets of X, then what is $[A \cap (X - B)] \cup B$ equal to ?**(2009-I)**

(a) A ∪ B (b) A ∩ B (c) A (d) B

20. If A, B, C are three finite sets, then what is $[(A \cap B) \cap C]'$ equal to?

(a) $A' \cup B' \cap C'$ (b) $A' \cap B' \cap C'$ (c) $A' \cap B' \cup C'$ (d) $A \cap B \cap C$

21. If $A = \{0,1\}$ and $B = \{1,0\}$, then what is A x B equal to?

(a) $\{(0,1),(1,0)\}$ (b) $\{(0,0),(1,1)\}$ (c) $\{(0,1),(1,0),(1,1)\}$ (d) A x A

22. If $n(A)=43,\ n(B)=51$ & $n(A\cup B)=75$, then $n[(A-B)\cup(B-A)]$ is

(a) 53 (b) 45 (c) 56 (d) 66

23. If A & B are non-empty sets such that B $\subset$ A, then

(a) $B'-A'=A-B$ (b) $B'-A'=B-A$ (c) $A'\cap B'=B-A$ (d) $A'\cup B'=A'-B'$

24. The set $A=\{x|x+4=4\}$ can also be represented by**(2012-I)**

(a) 0 (b) ∅ (c) {∅} (d) {0}

25. If X and Y are two sets, then $X\cap(Y\cup X)'$ is equal to

(a) X (b) Y (c) ∅ (d) none

26. If $n(A)=115, n(B)=326, n(A-B)=47$ then $n(A\cup B)$ is

(a) 373 (b) 165 (c) 370 (d) none

27. If $A\subseteq B$, then $B'-A'$ is equal to

(a) A' (b) B' (c) A–B (d) $\boldsymbol{\phi}$

28. If A=$\{(x,y)/\ x^2+y^2=25\}$ & B=$\{(x,y)/\ x^2+9y^2=144\}$, then A∩B contains

(a) one point (b) three points (c) two points (d) four points

29. Consider the following relations:-
1. A–B = A – (A∩B)
2. A = (A∩B)∪(A–B)
3. A – (B∪C)=(A–B) ∪(A–C)

Which of these is/are correct?

(a) (1) & (3) (b) (2) only (c)(2) & (3) (d) (1) & (2)

30. If A⊆B, then A △B is equal to

(a) (A–B)∩(B–A) (b)A–B (c)B–A (d) None

31. If ∅ denotes the empty set, then which one of the following is correct?

(a) ∅ ∈ ∅ (b) ∅ ∈ {∅} (c) {∅} ∈ {∅} (d) 0∈ ∅

32. In a group of 500 students, there are 475 students who can speak Hindi & 200 can speak Bengali. What is the number of students who can speak Hindi only?

(a) 275 (b) 300 (c) 325 (d) 350

33. If A and B are two sets, then A∩(A∪B) equals

(a) A (b) B (c) ∅ (d) none

34. Two finite sets have m and n elements. The total number of subsets of the first set is 56 more than total number of subsets of second set. The values of m and n are**(2009-I)**

(a) 7,6 (b) 6,3 (c) 5,1 (d) 8,7

35. If X & Y are two sets, then $X\cap(Y\cup X)'$ equal to :

(a) X (b) Y (c) ∅ (d) None

36. If $n(A) = 4, n(B) = 3, n(A \times B \times C) = 24$, then $n(c)$ is

(a) 288 (b) 12 (c) 17 (d) 2

37. If A & B are non-empty sets such that $A \supset B$, then

(a) $B' - A' = A - B$ (b) $B' - A' = B - A$ (c) $A' - B' = A - B$ (d) $A' \cap B' = B - A$

38. In a class of 60 students, 45 students like music, 50 students like dancing, 5 students like neither. Then the number of students in the class who like both music and dancing is **(2015-I)**

(a) 35 (b) 40 (c) 50 (d) 55

39. Let S be the set of all distinct numbers of the form $\frac{p}{q}$, where p,qϵ{1,2,3,4,5,6,}. What is the cardinality of the set S? **(2016-II)**

(a) 21 (b) 23 (c) 32 (d) 36

40. If $A = \{(x, y)/x^2 + y^2 \leq 1, x, y \epsilon R\}$& B = $\{(x, y)/x^2 + y^2 \geq 4, x, y \epsilon R\}$ then

(a) $A - B = \emptyset$ (b) $B - A = \emptyset$ (c) $A \cap B \neq \emptyset$ (d)$A \cap B = \emptyset$

ASSERTION-REASON BASED QUESTIONS

In the following questions ,a statement of assertion (A) is followed by a statement of Reason (R) . Choose the correct answer out of the following choices .

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

(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false .

(d) A is false but R is true .

1.Assertion: $Let\ n(U) = 200$,$n(A) = 120$ and $n(A \cap B) = 30$ then n(A$\cap B') = 90$

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

Ans: (a)

2. Assertion: If $A = \{x: x = 4n, n \in N\}$ and $B = \{x: x = 6n, n \in N\}$ then $A \cap B = \{24,48,72,96, \ldots.\}$

Reason: $A \cap B = \{ln: n \in N\ and\ l = LCM\ of\ (4,6)\}$

Ans: (d)

3. Assertion: If $A \cup B = A \cup C$ and $A \cap B = A \cap C$,then $B = C$

Reason: $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

Ans: (a)

4.Let $A = \{0,1,\{0,1\},2,3\}$ and $B = \{0,1\}$

Assertion:B is a subset of A.

Reason: B is an element of A

Ans: (b)

5. Assertion: $Let\ n(U) = 1000, n(S) = 720, n(T) = 450,$ then least value of $n(S \cap T)$ is 170

Reason:$n(S \cup T)$ is maximum when $n(S \cap T)$ is least.

Ans: (b)

Sol: $n(S \cup T) = n(S) + n(T) - n(S \cap T)$

$= 720 + 450 - n(S \cap T)$

$= 1170 - n(S \cap T) \leq n(U) \qquad (S \cup T \subset U)$

$\Rightarrow 1170 - \ n(S \cap T) \leq 1000$

$\Rightarrow n(S \cap T) \geq 170$

Least value is 170

Fill in the blank Type

SECTION-II(2 MARK EACH)

1. Using properties of set ,show that $(A - B) \cap B = \emptyset$
2. For any two sets Prove that P(A∩B) = P(A)∩P(B).
3. For any two sets A and B, Prove that P(A) = P(B)⇒ A = B.
4. For any three sets A, B and C, Prove that A – (B – C) = (A – B)∪(A∩C).
5. Show that if $A \subset B, then\ C - B \subset C - A.$
6. In a group of 400 people in USA, 250 can speak Spanish and 200 can speak English. How many people can speak both Spanish and English?
7. If $U = \{1,2,3,4,5,6,7,8,9\}, A = \{2,4,6,8\}$ and $B = \{2,3,5,7\}$,verify that

(i) $(A \cup B)' = A' \cap B'$ (ii) $(A \cap B)' = A' \cup B'$

8. Let $A = \{1,4,9,19\}$, $B = \{2,4,6,8\}$,$C = \{2,4,7,10\}$ and $D = \{1,3,4,5\}$
Find (i) $(A - B) \cap (C - D)$ (ii) $(A \cup B) \cap (C \cup D)$

SECTION-III(3 MARK EACH)

1.If A and B are two sets such that $n(A) = 17, n(B) = 23\ and\ n(A \cup B) = 38$,find the number of elements in exactly one of A and B.

ANS: $n(A \cup B) = 38$
$=> n(A) + n(B) - n(A \cap B) = 38$ 1mark
$=>17 + 23 - n(A \cap B) = 38$
$=> n(A \cap B) = 40 - 38 = 2$
No of elements in A only = $n(A) - n(A \cap B) = 17 - 2 = 15$ $\frac{1}{2}$ mark
No of elements in B only = $n(B) - n(A \cap B) = 23 - 2 = 21$ $\frac{1}{2}$ mark
No of elements in exactly A and B=15+21=36 1mark

SECTION-IV(4 MARK EACH)

1. Out of 100 students, 15 passed in English, 12 passed in Mathematics, 8 in Science, 6 in English & Mathematics, 7 in Mathematics & Science, 4 in English & Science, 4 in all the three. Find how many passed in
   (a) English & Mathematics but not in Science
   (b) Mathematics only
   (c) more than one subject

2. There are 200 individuals with a skin disorder,120 had been exposed to chemical C_1,50 to chemical C_2 and 30 to both the chemicals C_1 and C_2 . Find the number of individuals exposed to
   (i) chemical C_1 but not chemical C_2
   (ii) chemical C_2 but not chemical C_1
   (iii) chemical C_1 or chemical C_2

3. A college awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports, how many received medals in exactly two of the three sports.

4. A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 450 consumers like product B, what is the least number that must have liked both products?

5. In a class of 150 students ,the following results were obtained in a certain examination .45 students failed in mathematics ,50 students failed in physics ,48 students failed in Chemistry ,30 students failed in both mathematics and physics ,32 students failed in physics and Chemistry.35 students failed in both mathematics and Chemistry ,25 students failed in all three subjects .Find

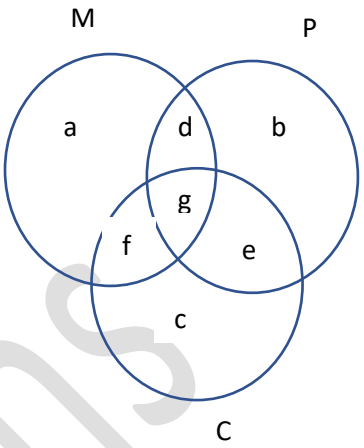
(i) The number of students failed in mathematics only.

(ii) The number of students failed in physics and Chemistry only.

Sol: Let M= set of students failed in mathematics.

P= set of students failed in physics.

C= set of students failed in chemistry.



As shown in Venn Diagram

$$a + d + f + g = 45 \Rightarrow a = 45 - 5 - 10 - 25 = 5$$

$$b + d + e + g = 50 \Rightarrow b = 50 - 5 - 7 - 25 = 8$$

$$c + e + f + g = 48 \Rightarrow c = 48 - 7 - 10 - 25 = 6$$

$$d + g = 30 \Rightarrow d = 5$$

$$e + g = 32 \Rightarrow e = 7$$

$$f + g = 35 \Rightarrow f = 10$$

$$g = 25$$

(i) Number of students failed in mathematics only $= a = 5$

(ii) Number of students failed in physics and chemistry only $= e = 7$

6. The students of a class are offered three languages(Hindi ,English and French).15 students learn all the three languages, whereas 28 students do not learn any language. The number of students learning Hindi and English but not French is twice the number of students learning Hindi and French but not English .The number of students learning English and French but not Hindi is thrice the number of students learning Hindi and French but not English .23 students learn only Hindi and 17 students learn only English. The total number of students learning French is 46 and the total number of students learning only French is 11.Find

(i) How many students learn precisely two languages.

(a) 55 (b) 40 (c) 30 (d) 13

(ii) How many students learn at least two languages.

(a) 15 (b) 30 (c) 45 (d) 55

(iii) How many students learn English and French.

(a) 30 (b) 43 (c) 45 (d) 73

(iv) What is the total strength of the class.

(a) 124 (b) 100 (c) 96 (d) 66

(v) How many students learn al least one language.

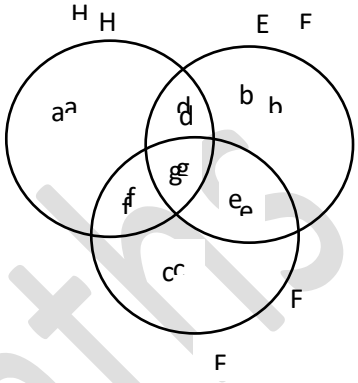
(a) 45 (b) 51 (c) 96 (d) none of these.

Sol: Let H= set of students learn Hindi.

E= set of students learn English.

F= set of students learn French.

As shown in Venn diagram



$g = 15, a = 23\ , b = 17, c = 11$

$c + e + f + g\ = 46$

$d\ = 2f$

$e = 3f$

$\therefore 11 + 3f + f + 15 = 46$

$\Rightarrow 4f = 40$

$\Rightarrow f = 5$

$\therefore e = 15, d = 10$

$(i) Number\ of\ students\ learn\ precisely\ two\ languages = d + e + f = 30.$

(ii) $Number\ of\ students\ learn\ at\ least\ \ two\ languages$

$$= d + e + f + g = 10 + 15 + 5 + 15 = 45$$

$(iii)\ Number\ of\ students\ learn\ English\ and\ French = e + g$

$$= 15 + 15 = 30$$

(iv) Total strength of class$= a + b + c + d + e + f + g + 28 = 23 + 17 + 11 + 10 + 15 + 5 + 15 + 28 = 124$

(v) $Number\ of\ students\ learn\ at\ least\ one\ language$

$$= a + b + c + d + e + f + g = 96$$

7. In a group of students ,15 are taking algebra ,11 are taking biology ,9 are taking both algebra and biology and 3 are not taking either courses. Find

(i) how many students are taking only algebra?

(ii) how many students are taking only biology?

(iii) how many students are in the entire group?

8. In an examination 27% of the students failed in Maths and 31% failed in physics. If 6% students failed in both the subjects ,find the percentage of students

(i) failed in examination

(ii) passed in both the subjects.

9. In a group of 40 students ,22 are taking Maths ,18 are taking Physics ,14 are taking Chemistry,9 are taking Maths and Physics ,7 are taking Maths and Chemistry ,5 are taking Physics and Chemistry and 2 are taking all three subjects. How many students are not taking any of these subjects ?

10. In a group of students ,12 read Maths ,15 read Physics,11 read Chemistry ,4 read Maths only ,7 read Physics only ,3 read Physics and Chemistry only and 1 read Maths and Physics only .Find

(i) how many read all three subjects ?

(ii) how many read Maths and Chemistry only ?

(iii) how many read Chemistry only ?

(iv) how many students are there altogether ?

11. In a survey of 60 people ,it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I ,11 read both T and H ,8 read both T and I ,3 read all three newspaper .Find

(i) the number of people who read at least one of the newspaper .

(ii) the number of people who read exactly one newspaper.

12. A class has 175 students . The following description gives the number of students studying one or more of the subjects in this class :

Maths : 100 ,Physics : 70 ,Chemistry : 46 , Physics and Maths : 30 , Maths and Chemistry :28 , Physics and Chemistry : 23 , Maths ,Physics and Chemistry :18 . Find

(i) How many students are enrolled in Maths alone ,Physics alone and Chemistry alone.

(ii) the number of students who have not offered any of these subjects .

13. In a town of 10,000 families ,it is found that 40% families buy newspaper A ,20% families buy newspaper B and 10% families buy newspaper C . 5% families buy A and B , 3% buy B and C and 4% buy A and C . If 2% families buy all the newspapers ,find the number of families which buy

(i) A only (ii) B only (iii) none of A,B,C.

14. In a class of 120 students ,numbered 1 to 120 , all even numbered students opts for physics ,whose numbers are divisible by

5 opt for chemistry and those whose numbers are divisible by 7 opt for Maths. How many opt for none of these subjects ?

15. In a class of 50 students ,10 did not opt for Maths ,15 did not opt for science and 2 did not opt for either .How many students of the class opted for both Maths and science?

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CHAPTER 2: Relation and Function

SECTION-I(1 MARK EACH)

Short Answer Type

1.If R is a relation defined by R=$\{(x,y)\ /\ x,y \in W, x^2+y^2=25\}$,write R in roster form.

2.If $f(x)=x^2, find\ \frac{f(1.1)-f(1)}{(1.1-1)}$

3.Find the domain of real function $f(x)=\frac{1}{\sqrt{x-|x|}}$.

4.If f(x) =$(a-x^n)^{\frac{1}{n}}$ then find f(f(x))

5. The function f is defined by

$$f(x)=\begin{cases}1-x, & x<0\\ 1, & x=0\\ 1+x, & x>0\end{cases}$$

Find f(5).

MCQ Type

1. If A={1,2,3}, B={1,4,6,9} and R is a relation from A to B defined by 'x is greater than y', then the range of R is
(a) {1,4,6,9} (b) {4,6,9} (c) {1} (d) none of these

2. Let $f: R \to R$ defined by $f(x)=\frac{|x|}{x}, x\neq 0, f(0)=2$. what is the range of f?(2009-II)

(a){1,2} (b) {-1,1) (c) {-1,1,2} (d) {1}

3.If $f(x)=(a-x^n)^{\frac{1}{n}}$, then $f\big(f(x)\big)$ is equal to

(a)x (b) $a-x$ (c)x^n (d) $x^{\frac{-1}{n}}$

4. Let $f\left(x+\frac{1}{x}\right)=x^2+\frac{1}{x^2}, x\in R-\{0\}$, then $f(x)$ is equal to

(a) x^2 (b) x^2-1 (c) x^2-2, when $|x|\geq 2$ (d) none

Ans (c)

5. The range of function $f(x)=|x|$ is
(a) $(0,\infty)$ (b) $(-\infty,0)$ (c) $[0,\infty)$ (d) none

6. Let R be a relation in N defined by $R=\{(x,y)/x+2y=8\}$. The range of R is
(a) {2,4,6} (b) {1,2,3} (c) {1,2,3,4,6} (d) none

For the next three (03) items that follow:-**(2014-II)**
Consider the function $f(x)=\frac{x-1}{x+1}$

7. What is $\frac{f(x)+1}{f(x)-1}+x$ equal to?
(a) 0 (b) 1 (c) 2 x (d) 4 x

8. What is $f(2x)$ equal to?

(a) $\frac{f(x)+1}{f(x)+3}$ (b) $\frac{f(x)+1}{3f(x)+1}$ (c) $\frac{3f(x)+1}{f(x)+3}$ (d) $\frac{f(x)+3}{3f(x)+1}$

9. What is $f\big(f(x)\big)$ equal to?
(a) x (b) $-x$ (c) $-\frac{1}{x}$ (d) none

10. If $R = \{(x,y)/x,y \in Z, x^2+y^2 \leq 4\}$ is a relation in Z, then domain of R is:
(a) {0,1,2} (b) {0,-1,-2} (c) {-2,-1,0,1,2} (d) None

11. The range of the function $f(x) = \frac{1+x^2}{x^2}$ is equal to
(a)[0,1) (b) (0, 1) (c) (1 , ∞) (d) [1, ∞)

12. If $f(x) = x^2 - x^{-2}$, $x \in R - \{0\}$, then $f\left(\frac{1}{x}\right)$ is equal to
(a) $f(x)$ (b) $-f(x)$ (c) $\frac{1}{f(x)}$ (d) $(f(x))^2$

13. Let R be a relation in N defined by $R = \{(x,y)/2x+y = 8\}$, then, range of R is
(a) {1,2,3} (b) {2,4,6} (c) {1,2,3,4,6} (d) none

Fill in the blank Type

ASSERTION-REASON BASED QUESTIONS

In the following questions ,a statement of assertion (A) is followed by a statement of Reason (R) . Choose the correct answer out of the following choices .

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

(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false .

(d) A is false but R is true .

1 .Assertion: Number of relations from the set $A = \{1,3\}$ to the set $B = \{-1,0,1\}$ is 32.
Reason : Number of relation from a set A to another set B is $2^{n(A\times B)}$
Ans: (d)

2. Assertion: If $(x+y, 3) = (5, x-y)$ then $x = 4, y = 1$

Reason :Two ordered pairs are equal if and only if their corresponding elements are equal.

Ans: (a)

3.Let $A = \{2,3,4,5\}$ and a relation R on A is defined as $R = \{(a,b): a \text{ is divisible } b \text{ and } a,b \in A\}$

Assertion: R in roster form is $\{(2,2),(2,4),(3,3),(4,4),(5,5)\}$

Reason : Domain and range of R is A.

Ans: (d)

4. Assertion: A relation $R = \{(1,3),(2,2),(3,1)\}$ defined on the set $A = \{1,2,3\}$ is a function

Reason : A relation from a set A to another set B is said to be a function if every elements of A is related to a unique element of B.

Ans: (a)

5. Assertion: For two sets A and B with $n(A) = 2$ and $n(B) = 2$,if$(a,1),(b,1),(a,2) \in A \times B$,

then $A = \{a,b,c\}$ and $B = \{1,2\}$

Reason :For two non-empty sets A and B $A \times B = \{(x,y): x \in A \text{ and } y \in B\}$

Ans: (d)

SECTION-II(2 MARK EACH)

1.Let $f = \{(1,1),(2,3),(0,-1),(-1,-3)\}$ be a linear function from Z to Z .Find $f(x)$.

Ans $f(x) = 2x - 1$

2.Let f be the subset of Z× Z defined by $f = \{(ab, a+b)/a, b \in Z\}$Is f a function from Z to Z ? Justify your answer.

ANS.$f = \{(ab, a+b)/a, b \in Z\}$

$f(0 \times 0) = 0 + 0 = 0$ => $f(0) = 0$ 1mark

$f(0 \times 1) = 0 + 1 = 1$ => $f(0) = 1$

Since 0 ∈ Z has more than one image and so f is not a function. 1mark

3. If P=$\{x / x < 3, x \in N\}, Q = \{x / x \leq 2, x \in W\}$ then find $(P \cup Q) \times (P \cap Q)$

ANS: $P = \{x/x < 3, x \in N\}$ =$\{1,2\}$ $\frac{1}{2}$mark

$Q = \{x/ x \leq 2, x \in W\} = \{0,1,2\}$

(P∪Q)= $\{0,1,2\}$ $\frac{1}{2}$mark

$(P \cap Q) = \{1,2\}$

$(P \cup Q) \times (P \cap Q) = \{(0,1)(0,2)(1,1)(1,2)(2,1)(2,2)\}$ 1mark

4. If 'f' is a real function defined by $f(x) = \frac{x-1}{x+1}$, then Prove that $f(2x) = \frac{3f(x)+1}{f(x)+3}$.

5. If y = f(x) = $\frac{ab-ax}{a-bx}$, Show that x = f(y).

6. Find the domain of the function: $f(x) = \frac{x^2+2x+1}{x^2-8x+12}$

7. Let R be a relation on N defined by $R = \{(1+x, 1+x^2)/ x \leqslant 4, x \in N\}$

Find domain & range of R.

SECTION-III(3 MARK EACH)

1. Let R be a relation from Q to Q defined by

$R = \{(a,b)/\ a,\ b \in Q \text{ and } a-b \in z\}$ show that

(i) (a, a) $\in$ R for all a $\in$ Q

(ii) (a, b) $\in$ R implies that (b, a) $\in$ R

(iii) (a, b) $\in$ R and (b, c) $\in$ R implies that (a, c) $\in$ R.

2. Let 'R' be the relation in the set Z of all integers defined by (a,b) ∈ R ⇒(a-b) is divisible by 2.

Prove that

(i) (a,a) ∈ R for all a ∈ Z

(ii) (a,b) ∈ R ⟹(b,a) ∈ R for all a,b∈ Z

(iii) (a,b) ∈ R and (b,c) ∈ R ⇒(a,c) ∈ R for all a,b,c ∈ Z

3. Find the domain and range of the real function $f(x) = \sqrt{9-x^2}$

Ans: Domain of $f(x) = [-3,3]$ and Range of $f(x) = [0,3]$

4. Let R={(x,y)|x,y∈R, y=2x+8}, if (a-2) and $(4,b^2) \in R$, find values of a and b.

5. Find the relation R on Z defined by {(a,b)|a,b∈Z and |x| = |y|}. Also write its domain and range.

6. Let $X = \{2,3,4,5\}$ and $Y = \{7,9,11,13,15,17\}$. $Define\ a\ relation\ f\ from\ X\ to\ Y\ by$:

$$f = \{(x,y) : x \in X, y \in Y \text{ and } y = 2x + 3\}.$$

(i)Write f in roster form.

(ii)Find domain of f and range of f

(iii)Show that f is a function from $X\ to\ Y$.

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CH-3: TRIGONOMETRIC FUNCTIONS

SECTION-I(1 MARK EACH)

MCQ Type

1. If α, β are positive angels such that $\alpha + \beta = \frac{\pi}{4}$, then what is $(1 + tan\,\alpha)(1 + tan\,\beta)$?(**2010-II**)

(a) 0 (b) 1 (c) 2 (d) 3

2. If $y = sec^2\theta + cos^2\theta$, where $0 < \theta < \frac{\pi}{2}$, then which one of the following is correct? (**2010-II**)

(a) $y = 0$ (b) $0 \le y \le 2$ (c) $y \ge 2$ (d) none

3. What is the value of $\frac{cosec(\pi+\theta)\cot\left(\frac{9\pi}{2}-\theta\right)\text{cosec}^2(2\pi-\theta)}{cot(2\pi-\theta)sec^2(\pi-\theta)sec\left(\frac{3\pi}{2}+\theta\right)}$? **(2007-I)**

(a) -1 (b) ∞ (c) 0 (d) 1

4.What is the value of $\sin 15^0 \sin 75^0$?(2010-II)

$\frac{1}{4}$ (b) $\frac{1}{8}$ (c)$\frac{1}{16}$ (d) 1

5.What is the value of$\cos\frac{\pi}{9}+\cos\frac{\pi}{3}+\cos 5\frac{\pi}{9}+\cos 7\frac{\pi}{9}$?(2010-II)

(a)1 (b) -1 (c) - $\frac{1}{2}$ (d) $\frac{1}{2}$

6.If $\sin\theta + sin^2\theta = 1$, then the value of $cos^{12}\theta + 3cos^{10}\theta + 3cos^8\theta + cos^6\theta - 1$ is

(a) 2 (b)1 (c) 0 (d) -1

7. If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$, then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$ is

(a) 3 (b) 2 (c) 1 (d) 0

8. The minimum value of $9tan^2\theta + 4cot^2\theta$ is

(a) 13 (b) 9 (c) 6 (d) 12

9. If $A = \frac{41}{12}\pi$, then what is the value of $\frac{1-3tan^2A}{3tanA-tan^3A}$?

(a) -1 (b) 1 (c) 1/3 (d) 3

Ans (b)

10. What is the value of $\sin(1110°)$?(**2008-II)**

(a) 1 (b) $\frac{1}{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{\sqrt{3}}{2}$

11. The value of $\frac{1-tan^2 15^0}{1+tan^2 15^0}$ is**(AIEEE-2002)**

(a) 1 (b) $\sqrt{3}$ (c) $\frac{\sqrt{3}}{2}$ (d) 2

12. If $\theta + \emptyset = \frac{\pi}{6}$, then what is the value of $\left(\sqrt{3}+\tan\theta\right)\left(\sqrt{3}+\tan\emptyset\right)$?

(a) 1 (b) -1 (c) 4 (d) -4

13. If $\alpha = \frac{\pi}{8}$, what is $\cos\alpha\cos 2\alpha\cos 4\alpha$? (**2007-II)**

(a) 0 (b) ¼ (c) 8 (d) 4

14. If $\cot(\alpha+\beta) = 0$ when α, β are acute angle then $\sin(\alpha + 2\beta)$ is

(a) $\sin\beta$ (b) $\cos\beta$ (c) $\sin\beta$ (d) $\sin 2\beta$

15. The value of $\sin A\sin(60^0 + A)\sin(60^0 - A)$ is

(a) $\frac{1}{4}\sin 3A$ (b) $\frac{1}{4}\sin 3A$ (c) $\sin 3A$ (d) none of these

16. The value of expression $\frac{1-4\sin 10^0 \sin 70^0}{2\sin 10^0}$ is

(a) ½ (b) 1 (c) 2 (d) none

17. If $\sin\theta + \cos ec\theta = 2$, then $\sin^n\theta + \cos ec^n\theta$ is

(a) 2 (b) 2^n (c) 2^{n-1} (d) none of these

18. The value of cot (–870°) is (**2007-II)**

(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) $-\sqrt{3}$ (d) $-\frac{1}{\sqrt{3}}$

19. The radius of the circle whose arc of length 15cm makes an angle of $\frac{3}{4}$ radian at the centre is

(a) 10cm (b) 20cm (c) $11\frac{1}{4}cm$ (d) $22\frac{1}{2}cm$

20. If $\cos x + \sin x = \sqrt{2}\left(0 < x < \frac{\pi}{2}\right)$, then the value of cos3*x* is

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) $-\frac{1}{\sqrt{2}}$

21. The value of $\sin 12^0 \sin 48^0 \sin 54^0$ is

(a) ½ (b) ¼ (c) 1/6 (d) 1/8

22. The value of $\cos\frac{\pi}{8}\cos\frac{3\pi}{8}\cos\frac{5\pi}{8}\cos\frac{7\pi}{8}$ is

(a) 1 (b) 1/8 (c) -1/8 (d) none of these

23. The value of *x* for the maximum value of $\sqrt{3}cosx + sinx$ is

(a) 30° (b) 45° (c)60° (d) 90°

24. What is the value of $sin18°cos36°$? (**2012-I)**

(a) 4 (b) 2 (c) 1 (d) $\frac{1}{4}$

10

25. Consider the following statements:- (**2012-I,2012-II)**

1. The value of $cos46° - sin46°$ is positive.
2. The value of $cos44° - sin44°$ is positive.

Which of the above statements is/are correct?

(a) 1 only (b) 2 only (c) both 1 & 2 (d) neither 1 nor 2

26. What is $sin^2 66\frac{1}{2}° - sin^2 23\frac{1}{2}°$ equal to ? (**2014-II)**

(a) $sin47°$ (b) $cos47°$ (c) $2sin47°$ (d) $2cos47°$

27. If $sinAsin(60° - A)\sin(60° + A) = Ksin3A$, then what is K ? (**2014-II)**

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) 1 (d) 4

28. The value of $2(cos^6\theta + sin^6\theta) - 3(cos^4\theta + sin^4\theta) + 1$ is

(a) 2 (b) 0 (c) 4 (d) 6

29. What is the value of $cos36°$? **(2014-I)**

(a) $\frac{\sqrt{5}-1}{4}$ (b) $\frac{\sqrt{5}+1}{4}$ (c) $\frac{\sqrt{10+2\sqrt{5}}}{4}$ (d) $\frac{\sqrt{10-2\sqrt{5}}}{4}$

31. $\frac{2}{\sqrt{2+\sqrt{2+\sqrt{2+2\cos 4x}}}}$ is equal to

(a) $\sec\frac{x}{2}$ (b) $\sec x$ (c) $cosec\ x$ (d) 1

ASSERTION-REASON BASED QUESTIONS (1 mark each)

In the following questions ,a statement of assertion (A) is followed by a statement of Reason (R) . Choose the correct answer out of the following choices .

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

(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false .

(d) A is false but R is true .

1. **Assertion (A) :** The value of $\theta = \frac{\pi}{3}\ or\ \frac{2\pi}{3}$,when θ lies between $(0,2\pi)$ and $\sin^2\theta = \frac{3}{4}$.

Reason (R): $\sin\theta$ is positive in the first and second quadrant .

SECTION-II (2 MARK EACH)

1. Prove that: $\frac{sin5x-2sin3x+sinx}{cos5x-cosx} = tanx$

2.Prove that: $\sin x + \sin 3x + \sin 5x + \sin 7x = 4\cos x \cos 2x \sin 4x.$

3.If tan 35° = p, then show that $\frac{1+\tan 45°\tan 125°}{\tan 145°-\tan 125°} = \frac{2p}{1-P^2}$

4. The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes? (Use π=3.14)

5.Find the value of: $2\sin^2\frac{\pi}{6} + \text{cosec}^2\frac{7\pi}{6}\cos^2\frac{\pi}{3}.$

6.If $\tan A = \frac{1}{2}, \tan B = \frac{1}{3}$ what is the value of $\tan(2A + B)$.

7. Prove that : $\frac{\sin\theta-\sqrt{1+\sin 2\theta}}{\cos\theta-\sqrt{1+\sin 2\theta}} = \cot\theta$

8. Prove that : $\cos^2 2x - \cos^2 6x = \sin 4x \sin 8x$

SECTION-III(3MARK EACH)

1.Prove that : $\cos^2 x + \cos^2\left(x+\frac{\pi}{3}\right) + \cos^2\left(x-\frac{\pi}{3}\right) = \frac{3}{2}.$

2.Prove that: $\tan 4x = \frac{4\tan x(1-\tan^2 x)}{1-6\tan^2 x+\tan^4 x}$

3.Prove that: $\cos 10° \cos 50° \cos 60° \cos 70° = \frac{\sqrt{3}}{16}$

4. Prove that $cos5\theta = 16cos^5\,\theta - 20cos^3\,\theta + 5cos\theta$

5. If $sin\theta = \alpha(\theta + 2\emptyset)$. Prove that $\tan(\theta + \emptyset) = \frac{1+\alpha}{1-\alpha} tan\emptyset$

6. Prove that $\sqrt{2+\sqrt{2+\sqrt{2}}} = 2cos\frac{\pi}{16}$

7. If $tanx + \tan\left(\frac{\pi}{3}+x\right) + \tan\left(\frac{2\pi}{3}+x\right) = 3$. Prove that $tan\,3x = 1$

8. Write the value of the expression $\frac{1-4\sin 10^0 \sin 70^0}{2\sin 10^0}$

9. Prove that : tan 6° tan 42° tan 66° tan 78° = 1.

10. $If\ A + B - C = 180°$,prove that

$$\sin^2 A + \sin^2 B - \sin^2 C = \sin A \sin B \cos C$$

11.Prove that: $\cos^6 A - \sin^6 A = \cos 2A(1 - \frac{1}{4}\sin^2 2A)$

12. Prove that $\cos 6x = 32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1$

SECTION-IV(4 MARK EACH)

1. If $\tan x = \frac{3}{4}$ where $\pi < x < \frac{3\pi}{2}$, then

(i) $\frac{x}{2}$ lies in

(a) I quadrant (b) II quadrant (c) IIIquadrant (d) IV quadrant.

(ii) The value of $\sin\frac{x}{2}$ is

(a) $-\frac{3}{\sqrt{5}}$ (b) $\frac{3}{\sqrt{5}}$ (c)$\pm\ \frac{3}{\sqrt{10}}$ (d) $\frac{3}{\sqrt{10}}$.

(iii) The value of $\cos\frac{x}{2}$ is

(a) $-\frac{1}{\sqrt{5}}$ (b) $\pm\frac{1}{\sqrt{5}}$ (c) $-\frac{1}{\sqrt{10}}$ (d) $\pm\frac{1}{\sqrt{10}}$

(iv) The value of $\tan\frac{x}{2}$ is

(a) -3 (b) 3 (c)$\pm$ 3 (d) $\frac{3}{2}$

(v) The value of $\sin 2x$ is

(a) $\frac{24}{25}$ (b) $\frac{9}{16}$ (c)$-\ \frac{24}{25}$ (d) $none\ of\ these$

ANS1. .(i) (b) (ii) (d) (iii)(c) (iv) (a) (v)(a) 4 mark

SECTION-V(5 MARK EACH)

1. Prove that $\cos\theta\cos 2\theta\cos 2^2\theta\cos 2^3\theta.....\cos 2^{n-1}\theta = \dfrac{\sin 2^n\theta}{2^n\sin\theta}$

Hence show that if $\theta = \dfrac{\pi}{2^n+1}$

$2^n\cos\theta\cos 2\theta\cos 2^2\theta.....\cos 2^{n-1}\theta = 1$

2. Prove that $(1+\cos\frac{\pi}{10})(1+\cos\frac{3\pi}{10})(1+\cos\frac{7\pi}{10})(1+\cos\frac{9\pi}{10}) = 1$.

3. Using the result $cos\theta cos2\theta cos2^2\theta \dots\dots\dots cos2^{n-1}\theta = \frac{sin2^n\theta}{2^n sin\theta}$

Prove that $(1+sec2\theta)(1+sec2^2\theta)(1+sec2^3\theta) \dots\dots (1+sec2^n\theta) = \frac{tan2^n\theta}{tan\theta}$

4. If $cosx = \frac{-1}{3}$, $\pi < x < \frac{3\pi}{2}$, find $sin\frac{x}{2}, cos\frac{x}{2}, tan\frac{x}{2}$

5 . Prove that :$\tan 9° - \tan 27° - \tan 63° + \tan 81° = 4$

6. Prove that $\cos 2x\cos\frac{x}{2} - \cos 3x\cos\frac{9x}{2} = \sin 5x\sin\frac{5x}{2}$.

SOURCE BASED/CASE BASED/PASSAGE BASED/INTEGRATED UNITS OF ASSESSMENT (4 MARKS)

1 If $\sin A = \frac{3}{5}$ and $\cos B = -\frac{5}{13}$;$0 < A < \frac{\pi}{2}$ and $\pi < B < 3\frac{\pi}{2}$

(i) Find the value of $\cos A + \sin B$

(a) $-\frac{16}{65}$ (b) $-\frac{8}{65}$ (c) $\frac{8}{65}$ (d) $\frac{12}{65}$

(ii) Find the value of $\sin(A+B)$

(a) $-\frac{63}{65}$ (b) $-\frac{33}{65}$ (c) $-\frac{65}{33}$ (d) $\frac{33}{65}$

(iii) Find the value of $\cos(A+B)$

(a) $\frac{12}{65}$ (b) $-\frac{12}{65}$ (c) $-\frac{16}{65}$ (d) $\frac{16}{65}$

(iv) Find the value of $\sin 2A$

(a) $\frac{14}{25}$ (b) $\frac{24}{25}$ (c) $-\frac{14}{25}$ (d) $-\frac{24}{25}$

(v) Find the value of $\tan(A+B)$

(a) $\frac{16}{63}$ (b) $\frac{63}{16}$ (c) $-\frac{63}{16}$ (d) $\frac{73}{65}$

2. In a class test of class XI , a teacher asked to students to consider $A+B = \frac{\pi}{4}$,where A and B are acute angles .Based on the above information ,answer the following questions :

(i) Find the value of $(1+\tan A)(1+\tan B)$

(ii) Find the value of $(\cot A - 1)(\cot B - 1)$

(iii) Find the value of $\sin(A+B)-\cos(A+B)+\tan(A+B)$

(iv) Find the value of $\sin 2A \sec 2B$

CH : 5 complex number

SECTION-I(1 MARK EACH)

Short Answer Type

1 .Find the value of $i^n + i^{n+1} + i^{n+2} + i^{n+3}$ where $i=\sqrt{-1}$ and $n \in N$

2. If $(\cos\theta - isin\theta)^2 = x - iy$, Prove that $x^2 + y^2 = 1$.

3. Write the multiplicative inverse of $2-3i$ in $a+ib$ form.

4. Find the complex number if its conjugate is $\frac{1}{i-1}$

5.If $4x + i(3x - y) = 4 + i(-3)$, where x and y are real numbers, then find the values of x and y.

6.Express i^{-35} in the form of a + ib.

7. If $z = 5+(4-x^2)i$ is purely real find x.

MCQ Type

1. $(\sqrt{-2})(\sqrt{-3})$ is equal to
   (a) $\sqrt{6}$ (b) $-\sqrt{6}$ (c) $i\sqrt{6}$ (d) none of these
2. The amplitude of $\frac{1}{i}$ is equal to
   (a) 0 (b) $\frac{\pi}{2}$ (c) $-\frac{\pi}{2}$ (d) π

3. If Z_1, Z_2 are two non-zero complex numbers such that $|Z_1+Z_2|=|Z_1|+|Z_2|$, then $argZ_1 - argZ_2$ is
   (a) $\frac{\pi}{2}$ (b) $-\pi$ (c) 0 (d) $-\frac{\pi}{2}$
4. What is the argument of the complex number $(-1-i)$ where $i=\sqrt{-1}$?**(2013-I)**
   (a) $\frac{5\pi}{4}$ (b) $-\frac{5\pi}{4}$ (c) $\frac{3\pi}{4}$ (d) None
5. If $\frac{(a+i)^2}{2a-1} = p+iq, then\ p^2+q^2$ is
   (a) $\frac{(a^2+1)^2}{2a^2+1}$ (b) $\frac{(a^2+1)^2}{2a^2-1}$ (c) $\frac{(a^2+1)^2}{(2a^2-1)^2}$ (d) None
6. If $|Z+4| \le 3$, then $|Z+1| \le$?
   (a) 5 (b) 8 (c) 6 (d) none
7. The smallest positive integer n for which $(1+i)^{2n} = (1-i)^{2n}$ is
   (a) 4 (b) 8 (c) 2 (d) 16

8.What is the value of $1 + i^2 + i^4 + i^6 + \cdots + i^{100}$ where$i=\sqrt{-1}$

0 (b) 1 (c) -1 (d) none

9. For all complex nos. $Z_1 \& Z_2$ satisfying $|Z_1| = 12$ $\& |Z_2 - 3 - 4i| = 5$, the minimum value of $|Z_1 - Z_2|$ is

(a) 0 (b) 2 (c) 7 (d) 17

10. Let $Z = i^3(1+i)$ be a complex number. What is arg Z?(**2006-II**)

(a) π (b) $\frac{\pi}{4}$ (c) $-\frac{\pi}{4}$ (d) $5\frac{\pi}{4}$

11. Square root of $-i$ is

(a) $\frac{1-i}{\sqrt{2}}$ (b) $\frac{2+i}{2}$ (c) $\frac{1+i}{\sqrt{2}}$ (d) None

12. The value of sum $\sum_{n=1}^{13}\left(i^n + i^{n+1}\right)$ when $i = \sqrt{-1}$ is (**2012-II**)

(a) i (b) $-i$ (c) 0 (d) $i - 1$

Ans (d)

13. If $|z| = 1$ then $\frac{1+z}{1+\bar{z}}$ is equal to

(a) z (b) $\bar{z}$ (c) $z + \bar{z}$ (d) none

14. Let $z_1 \& z_2$ be two non zero complex numbers such that $|z_1| = |z_2| = |\frac{1}{z1} + \frac{1}{z2}| = 2$, then what is the value of $|z_1 + z_2|$? (**2006-II**)

(a) 8 (b) 4 (c) 2 (d) 1

15. If $|z + \bar{z}| = |z - \bar{z}|$, then the locus of Z is**(2014-I)**

(a) A pair of straight line (b) A line

(c) A set of four straight lines (d)A circle

16. What is $\frac{(1+i)^{4n+5}}{(1-i)^{4n+3}}$ equal to, where n is a natural number and $i = \sqrt{-1}$ (**2014-II**)

(a) 2 (b) $2i$ (c) $-2i$ (d) i

17. If a,b,c are in G.P. and $z = \frac{a+ib}{c-ib}$, then z is

(a) $\frac{ib}{c}$ (b) $\frac{ic}{b}$ (c) $\frac{ia}{c}$ (d) 0

18. If $Z = \frac{(\sqrt{3}+i)^3(3i+4)^2}{(8+6i)^2}$, then $|Z|$ is equal to

(a) 1 (b) 3 (c) 0 (d) 2

19. What is the argument of the complex number $(-1-i)$ where $i = \sqrt{-1}$? **(2013-I)**

(a) $\frac{5\pi}{4}$ (b) $-\frac{5\pi}{4}$ (c) $\frac{3\pi}{4}$ (d) None

20. If $\frac{z_2}{z_1}$ is purely imaginary, then $\left|\frac{2z_1+3z_2}{2z_1-3z_2}\right|$ is

(a) $\frac{2}{3}$ (b) $\frac{3}{2}$ (c) 1 (d) $\sqrt{13}$

21. If $\alpha \& \beta$ are different complex numbers with $|\beta| = 1$ then $\left|\frac{\beta-\alpha}{1-\bar{\alpha}.\beta}\right|$ is

(a) 2 (b) ½ (c) 1 (d) $^1/_3$

ASSERTION-REASON BASED QUESTIONS

In the following questions ,a statement of assertion (A) is followed by a statement of Reason (R) . Choose the correct answer out of the following choices .

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

(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false .

(d) A is false but R is true

1.Assertion (A): Simplest form of $\frac{5+i\sqrt{2}}{1-i\sqrt{2}}$ is $1-2i\sqrt{2}$

Reason (R) : The value of $(1+i)^5(1-i)^5$ is 32.

Ans: (d)

2. Assertion (A): If $(1+i)^5 = a+ib$, then $b=-8$

Reason (R) : $(1-i)^3 = a+ib$, then $\frac{a}{b}=1$

Ans: (b)

3. Assertion (A): If $z=\frac{1+i2}{1-i3}$,then $|z|=\frac{1}{\sqrt{2}}$

Reason (R) : If $z=a+ib$, then $|z|=\sqrt{a^2+b^2}$

Ans: (a)

4. Assertion (A): Multiplicative inverse of $2-3i$ is $2+3i$

Reason (R) : If $z=3+4i$, then $\bar{z}=3-4i$

Ans: (d)

Fill in the blank Type

SECTION-II(2 MARK EACH)

1 .Find the conjugate of $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$

2. If $x-iy=\sqrt{\frac{a-ib}{c-id}}$, prove that $(x^2+y^2)^2=\frac{a^2+b^2}{c^2+d^2}$

Proof: $x-iy=\sqrt{\frac{a-ib}{c-id}}$

$\Rightarrow (x-iy)^2=\frac{a-ib}{c-id}$

$\Rightarrow |(x-iy)^2| = \left|\frac{a-ib}{c-id}\right|$ 1 mark

$\Rightarrow |(x-iy)|^2 = \frac{|a-ib|}{|c-id|}$

$\Rightarrow \left(\sqrt{x^2+y^2}\right)^2 = \frac{\sqrt{a^2+b^2}}{\sqrt{c^2+d^2}}$

$\Rightarrow x^2+y^2 = \frac{\sqrt{a^2+b^2}}{\sqrt{c^2+d^2}}$

$\Rightarrow (x^2+y^2)^2=\frac{a^2+b^2}{c^2+d^2}$ 1 mark

3. Write the complex number $\frac{1}{1+Cos\,\theta+iSin\theta}$ in a+ib form.

4. Find real values of x and y for which the complex numbers

$(-3+ix^2y) and\ (x^2+y+4i)$ are conjugate of each other.

5. If $x+iy = \frac{a+ib}{a-ib}$, prove that $x^2+y^2=1$

Proof: $x+iy = \frac{a+ib}{a-ib}$

$$\Rightarrow |x+iy| = \left|\frac{a+ib}{a-ib}\right|$$

$$\Rightarrow \sqrt{x^2+y^2} = \frac{|a+ib|}{|a-ib|}$$

$$\Rightarrow \sqrt{x^2+y^2} = \frac{\sqrt{a^2+b^2}}{\sqrt{a^2+b^2}} = 1$$

$$\Rightarrow x^2+y^2 = 1$$

6.Find the modulus of the complex number $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$.

7. Solve: $ix^2 + 4x - 5i = 0$.

SECTION-III(3 MARK EACH)

1.If $(x+iy)^3 = u+iv$,then show that $\frac{u}{x}+\frac{v}{y} = 4(x^2-y^2)$

ANS: $(x+iy)^3 = u+iv$

$$=> x^3+3x^2iy+3x(iy)^2+(iy)^3 = u+iv$$

$$=> (x^3-3xy^2)+i(3x^2y-y^3) = u+iv$$ 1mark

Equating real and imaginary parts

$u = x^3-3xy^2$, $v = 3x^2y-y^3$

$\frac{u}{x} = x^2-3y^2$, $\frac{v}{y} = 3x^2-y^2$ 1mark

$\therefore \frac{u}{x}+\frac{v}{y} = (x^2-3y^2)+(3x^2-y^2) = 4(x^2-y^2)$ 1mark

2.Find the modulus and argument of the complex number $\frac{1+2i}{1-3i}$

Sol: Here $Z = \frac{1+2i}{1-3i}$

$$= \frac{(1+2i)(1+3i)}{(1-3i)(1+3i)}$$ [1]

$$= \frac{-5+5i}{1+9}$$

$$= -\frac{1}{2}+\frac{1}{2}i$$

$$|Z| = \sqrt{(-\frac{1}{2})^2+(\frac{1}{2})^2}$$

$= \sqrt{\frac{1}{4}+\frac{1}{4}}$

$= \frac{1}{\sqrt{2}}$ [1]

$Let\ \theta\ be\ the\ argument\ of\ Z$

$\therefore \tan\theta = \frac{1/2}{-1/2} = -1$ [1]

$\Rightarrow \tan\theta = -\tan\frac{\pi}{4}$

$\Rightarrow \theta = n\pi - \frac{\pi}{4}$

$When\ n = 0 \Rightarrow \theta = -\frac{\pi}{4}$

$n = 1 \Rightarrow \theta = 3\frac{\pi}{4}$

$But\ the\ given\ complex\ no\ lies\ in\ II\ quadrant.$

$$\therefore \theta = 3\frac{\pi}{4}$$

3..If $(x+iy)^3 = a+ib$, when x,y,a,b$\in R$, Show that $\frac{x}{a}-\frac{y}{b} = -2(a^2+b^2)$.

4.Solve the equation $z^2 = \bar{z}$

5. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ into polar form.

6. If z is a complex number such that |z|=1 ,Prove that $\frac{z-1}{z+1}$ is purely imaginary.

7. If $\alpha\ and\ \beta$ are different complex numbers with $|\beta| = 1$, then find $\left|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}\right|$.

8. Express $(-2-\frac{1}{3}i)^3$ in the form a+ib.

9.Represent the complex number $z = 1 + i\sqrt{3}$ in the polar form .

10. Reduce $\left(\frac{1}{1-4i}-\frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$ to the standard form.

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

$$= \frac{1+i-2+8i}{(1-4i)(1+i)} \times \frac{(3-4i)}{(5+i)}$$

$$= \frac{(-1+9i)}{(1+i-4i+4)} \times \frac{(3-4i)}{(5+i)}$$

$$= \frac{-3+4i+27i+36}{(5-3i)(5+i)}$$

$$= \frac{33+31i}{25+5i-15i+3}$$

$$= \frac{33+31i}{28-10i}$$

$$= \frac{33+31i}{2(14-5i)}$$

$$= \frac{(33+31i)(14+5i)}{2\times(196+25)}$$

$$= \frac{462+165i+434i-155}{442}$$

$$= \frac{307+599i}{442}$$

$$= \frac{307}{442} + i\frac{599}{442}$$

SECTION-IV(4 MARK EACH)

1. Convert the complex number $z = \frac{i-1}{cos\frac{\pi}{3}+sin\frac{\pi}{3}}$ in the polar form.

CH -SEQUENCE and SERIES

SECTION-I(1 MARK EACH)

Short Answer Type

1 .Find the arithmetic mean between 14 and -6.

2.If three numbers $-\frac{2}{7}, x, -\frac{7}{2}$ are in G.P. then find x.

3.In a G.P, the 3rd term is 24 and the 6th term is 192. Find the 10th term.

4.Find the $value\ of\ 7^{th}$ term of an A.P whose k^{th} term is 5k+1.

MCQ Type

1. If a, b, c are in G.P then $\frac{1}{a^2-b^2} + \frac{1}{b^2}$ is

   (a) $\frac{1}{c^2-b^2}$ (b) $\frac{1}{b^2-c^2}$ (c) $\frac{1}{c^2-a^2}$ (d) $\frac{1}{b^2-a^2}$

2. The sum of an infinity G.P is 6. If the sum of the first two terms is $\frac{9}{2}$, then what is the first term?

   (a) 1 (b) $\frac{5}{2}$ (c) 3 or $\frac{3}{2}$ (d) 9 or 3

3. If x, y, z are in G.P, then log x, log y, log zare in

   (a) A.P (b) G.P (c) H.P (d) none

4. If the first term of an infinite G.P is 1 and each term is twice the sum of the succeeding terms, then the common ratio is

   (a) $\frac{1}{3}$ (b) $\frac{2}{5}$ (c) $\frac{3}{4}$ (d) none

5. If x, y, z are in A.P., then $\frac{1}{yz}, \frac{1}{zx}, \frac{1}{xy}$ are in

(a) G.P. (b) H.P. (c) A.P. (d) none

6. If pth term of an A.P be q and qth term be p, then its rth term will be

(a) $p + q + r$ $(b) p + q - r$ $(c) p + r - q$ $(d) p - q - r$

7. If $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}} \& a, b, c$ are in G.P, then x, y, z will be in

(a) A.P (b) G.P (c) H.P (d) none of these

8. If the A.M of $a \& b$ is $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$, the value of $n$is

(a) -1 (b) 0 (c) 1 (d) none of these

9. The m^{th}term of an A.P is $\frac{1}{n}$ and n^{th}term is$\frac{1}{m}$, then what is $(mn)^{th}$ term?

(a) $\frac{1}{mn}$ (b) $\frac{m}{n}$ (c) $\frac{n}{m}$ (d) 1

10. Fifth term of a G.P is 2, then the product of its first 9 term is(AIEEE-2002)

(a) 256 (b) 512 (c) 1024 (d) none

11. If nth term of an A.P is 2n – 1, then what is the sum upto n term?

(a) n^2 (b) $n^2 - 1$ (c) $n^2 + 1$ (d) ½ n(n+1)

12. If $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are in H.P, then a, b, c are in

(a) A.P (b) G.P (c) H.P (d) none

13. What is the value of $7^{\frac{6}{7}} \cdot 7^{\frac{6}{7^2}} \cdot 7^{\frac{6}{7^3}} \ldots\ldots\ldots\ldots \propto$

(a) $\log_7\left(\frac{6}{7}\right)$ (b) $\propto$ (c) $\frac{6}{7}$ (d) 7

14. The product of 6 geometric means inserted between 81 and 1/27 is

(a) 243 (b) 27 (c) 3 (d) 9

15. If no. of terms of A.P is $(2n + 1)$, what is the ratio of sum of odd terms to the sum of even terms?(**2008-II)**

(a) $\frac{n}{n+1}$ (b) $\frac{n^2}{n+1}$ (c) $\frac{n+1}{n}$ (d) $\frac{n+1}{2n}$

16. If the 2nd term of a G.P is 2 and the sum of its infinite terms is 8, then its first term is

(a) ½ (b) ¼ (c) 2 (d) 4

17. If the sum of *p* terms of an *A.P* is *q* and that of *q* terms is *p*, then the sum of *p+q* terms is

(a) O (b) $p - q$ (c) $p + q$ (d) $-(p + q)$

18. The value of $\frac{1}{\log_{xy} xyz}+\frac{1}{\log_{yz} xyz}+\frac{1}{\log_{zx} xyz}$ is

(a) 1 (b) 2 (c) 3 (d) 4

19. If a, b, c are in H.P, then $\frac{a}{b+c},\frac{b}{c+a},\frac{c}{a+b}$ are in

(a) A.P. (b) G.P. (c) H.P. (d) none of these

20. If 1, *x, y, z*, 2 are in G.P, then *xyz* is

(a) 4 (b) 2 (c) 8 (d) none of these

21. The sum of $\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+.....+\frac{1}{n(n+1)}$ is

(a) $\frac{1}{n(n+1)}$ (b) $\frac{n}{n+1}$ (c) $\frac{2n}{n+1}$ (d) $\frac{2}{n(n+1)}$

22. If a, b, c, d, e, f are in A.P then (e – c) is equal to which one of the following?(**2011-II**)

(a) 2 (c – a) (b) 2 (d – c) (c) 2 (f – d) (d) (d – c)

23. Let T_r be the r^{th} term of an $A.P$ whose first term in a and common difference is d. If for some positive integers $m, n, m \neq n, Tm = \frac{1}{n} \& Tn = \frac{1}{m}$ then $a - d$ is (**AIEEE-2004**)

(a) 0 (b) l (c) $\frac{1}{mn}$ (d) $\frac{1}{m}+\frac{1}{n}$

24. If $\frac{1}{b-a}+\frac{1}{b-c}=\frac{1}{a}+\frac{1}{c}$, then a, b, c are in (**2011-I**)

(a) A.P (b) G.P (c) H.P (d) none

25. $2^{\frac{1}{4}} . 4^{\frac{1}{8}} . 8^{\frac{1}{16}} . 16^{\frac{1}{32}}$ ... ... is equal to

(a)1 (b) 2 (c) $\frac{3}{2}$ (d) $\frac{5}{2}$

26. If H.M. and G.M. of two positive numbers a & b are in the ration 4 : 5, then a : b is

(a) 1:2 (b) 2:3 (c) 3: 4 (d) 4:1

27. If $x>1,\ y>1,\ z>1$ are in G.P., then $\frac{1}{1+logx}, \frac{1}{1+logy}, \frac{1}{1+logz}$ are in

(a) $A.P.$ (b) $G.P.$ (c) $H.P.$ (d) none

28. If the numbers $n-3,\ 4n-2,\ 5n+1$ are in A.P what is the value of n ?(**2013-I**)

(a) 1 (b) 2 (c) 3 (d) 4

29 . What is the sum of the series 0.5+0.55+0.555+..... to n terms (**2015-I**)

(a) $\frac{5}{9}[n-\frac{2}{9}(1-\frac{1}{10^n})]$ (b) $\frac{1}{9}[5-\frac{2}{9}(1-\frac{1}{10^n})]$

(c) $\frac{1}{9}[n-\frac{5}{9}(1-\frac{1}{10^n})]$ (d) $\frac{5}{9}[n-\frac{1}{9}(1-\frac{1}{10^n})]$

30. If $\frac{1}{ab+ac}, \frac{1}{bc+ba}, \frac{1}{ca+cb}$ are in H.P, then a,b,c are in (**2016-II**)

(a) A.P (b) G.P (c) H.P (d) none

MCQ FOR SCHOOL CLASS EXAM

1.The third term of a GP is 42,then the product of its first five terms is

(a) 42 (b) $(42)^5$ (c) 98 (d) $(25)^5$

Ans: (b)

2.which term of the sequence 4, 9, 14, 19 ,…….is 124 ?

(a) 25th (b) 20th (c) 26th (d) 21st

Ans: (a)

3. the value of $3^{\frac{1}{2}}.\ 3^{\frac{1}{4}}.3^{\frac{1}{8}}.3^{\frac{1}{16}}\ldots\ldots\ldots\infty$ is

(a) 3 (b) ∞ (c) 3^{∞} (d) $none\ of\ these$

Ans: (a)

4. The minimum value of $4^x + 4^{1-x}, x \in R$ is

(a) 2 (b) 4 (c) 1 (d) 0

Ans: (b)

5.The third term of a GP is 42,then the product of its first five terms is

(a) 42 (b) $(42)^5$ (c) 98 (d) $(25)^5$

Ans: (b)

6.If the sum of n terms of an AP is given by $S_n = 3n + 2n^2$,then the common difference of the AP is

(a) 3 (b) 2 (c) 6 (d) 4

Ans: (d)

7. The value of $3^{\frac{1}{2}}.\ 3^{\frac{1}{4}}.3^{\frac{1}{8}}.3^{\frac{1}{16}}\ldots\ldots\ldots\infty$ is

(a) 3 (b) ∞ (c) 3^{∞} (d) $none\ of\ these$

Ans: (a)

8. If in an AP ,$S_n = n^2p$ and $S_m = m^2p$, where S_r denotes the sum of the r terms of the AP ,then S_p is equal to

(a) $\frac{1}{2}p^3$ (b) mnp (c) p^3 (d) $(m+n)p^2$

Ans: (c)

Fill in the blank type

1. The value of $9^{\frac{1}{3}}.\ 9^{\frac{1}{9}}.\ 9^{\frac{1}{27}}$…… to ∞ is _____

ASSERTION-REASON BASED QUESTIONS

In the following questions ,a statement of assertion (A) is followed by a statement of Reason (R) . Choose the correct answer out of the following choices .

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

(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false .

(d) A is false but R is true .

1. Assertion (A) : If the sum of first two terms of an infinite GP is 5 and each term is three times the sum of the succeeding terms, then the common ratio is $\frac{1}{4}$.

Reason(R): In an AP of 3 ,6 , 9 ,12 ,…. the 10th term is equal to 30.

Ans: (b) Hint : $a = 3\frac{ar}{1-r} \Rightarrow 1 - r = 3r \Rightarrow r = \frac{1}{4}$

2. Assertion (A) :The sum of first n terms of the series $0.6 + 0.66 + 0.666 + \cdots ..$ is $\frac{2}{3}\left[n - \frac{1}{9}\left\{1 - \left(\frac{1}{10}\right)^n\right\}\right]$

Reason(R):General term of a GP is $t_n = ar^{n-1}$, where a= first term and r=common difference.

Ans: (b)

SECTION-II(2 MARK EACH)

1 .If AM and GM of two positive numbers a and b are 10 and 8 respectively, find the numbers.

2 .If a,b,c are in GP and $a^{1/x} = b^{1/y} = c^{1/z}$,prove that $x, y, z \; are \; in$ AP.

3. If f is a function satisfying $f(x+y) = f(x).f(y)$ for all $x, y \in N$ such that $f(1)=3$ and $\sum_{x=1}^{n} f(x)=120$, find the value of n.

Sol: Here $f(x+y) = f(x)f(y)$ & $f(1) = 3$
$\therefore\ f(2) = f(1+1) = f(1)\,f(1) = 3.3 = 3^2$
$f(3) = f(2+1) = f(2).f(1) = 3^2.3 = 3^3$
$f(4) = f(3+1) = f(3).f(1) = 3^3.3 = 3^4$
⋮
Similarly $f(n) = 3^n$
Now $\sum_{x=1}^{n} f(x) = 120$
$\Rightarrow f(1) + f(2) + f(3) + \ldots\ldots + f(n) = 120$
$\Rightarrow 3+3^2+3^3+ \ldots\ldots\ldots\ldots +3^n = 120$
$\Rightarrow 3.\frac{3^n-1}{3-1} = 120$
$\Rightarrow 3^n - 1 = \frac{120\times 2}{3} = 80$
$\Rightarrow 3^n = 81 = 3^4$
$\therefore\ n = 4$

4. In an A.P.if pth term is $\frac{1}{q}\ and$ qth term is $\frac{1}{p}$, prove that sum of first pq terms is $\frac{1}{2}(pq+1)$,where $p \neq q$.

Sol: Let first term $= a$ and common difference $= d$

B/Q $t_p = \frac{1}{q} \Rightarrow a + (p-1)d = \frac{1}{q} \longrightarrow (1)$

$t_q = \frac{1}{p} \Rightarrow a + (q-1)d = \frac{1}{p} \longrightarrow (2)$

$(1) - (2)$ gives

$$(p-1)d - (q-1)d = \frac{1}{q} - \frac{1}{p}$$

$$\Rightarrow (p-q)d = \frac{p-q}{pq}$$

$$\Rightarrow d = \frac{1}{pq}$$

$From\ (1) \quad a + (p-1)\frac{1}{pq} = \frac{1}{q}$

$$\Rightarrow a + \frac{1}{q} - \frac{1}{pq} = \frac{1}{q}$$

$$\Rightarrow a = \frac{1}{pq}$$

Now $S_{pq} = \frac{pq}{2}[2a + (pq-1)d]$

$$= \frac{pq}{2}\left[2\frac{1}{pq} + (pq-1)\frac{1}{pq}\right]$$

$$= 1 + \frac{pq-1}{2}$$

$$= \frac{pq+1}{2}$$

. **SECTION-III(3 MARK EACH)**

1. Find the sum of all natural numbers lying between 100 and 1000, which are multiples of 5.

2. How many terms of the G.P. 3, $\frac{3}{2}, \frac{3}{4}$,....., , ,... are needed to give the sum $\frac{3069}{512}$?

3. If $a\left(\frac{1}{b}+\frac{1}{c}\right), b\left(\frac{1}{c}+\frac{1}{a}\right), c\left(\frac{1}{a}+\frac{1}{b}\right)$ are in A.P., Prove that a, b, c are in A.P.

4. If the sum of n terms of an A.P is $3n^2 + 5n$ and its m^{th} term is 164, find the value of m.

5.Find the sum of the following series up to n terms : 5+55+555+5555+....

SECTION-IV(4 MARK EACH)

SOURCE BASED/CASE BASED/PASSAGE BASED/INTEGRATED UNITS OF ASSESSMENT (4 MARKS)

1.Read the Case study 2 given below and attempt any 4 sub parts:

Father of Ashok is a builder, He planned a 12 story building in Gurgaon sector 5. For this, he bought a plot of 500 square yards at the rate of Rs 1000 /yard^2. The builder planned ground floor of 5 m height, first floor of 4.75 m and so on each floor is 0.25 m less than its previous floor.

Now Answer the following questions:

i. What is the height of the last floor?
   a. 2.5 m
   b. 2.75 m
   c. 2.25 m
   d. 3 m

ii. Which floor no is of 3 m height?
   a. 5
   b. 7
   c. 10
   d. 9

iii. What is the total height of the building?
   a. 40 m
   b. 43.5
   c. 40.5 m
   d. 44 m

iv. Up to which floor the height is 33 m?
   a. 8
   b. 7

c. 10
d. 9

v. Which floor no. is half in height of ground floor?

a. 10
b. 9
c. 12
d. 11

2.A manufacturer produces 600 laptops in third year and 700 laptops in seventh year .Assuming that the production increases uniformly by a constant number every year,

(i) find the value of the fixed number by which production is increasing every year .

(a) 20 (b) 25 (c) 30 (d) 35

Ans (b)

(ii) find the production in first year

(a) 400 (b) 350 (c) 500 (d) 550

Ans (d)

(iii) find thetotal production in 6 years

(a) 3600 (b) 3650 (c) 3675 (d) 3725

Ans (c)

(iv) find the number of laptops manufactured in 10^{th} year.

(a) 775 (b) 770 (c) 800 (d) 850

Ans (a)

SECTION-V(5 MARK EACH)

1. If p, q, r are in G.P. and the equations, $px^2 + 2qx + r = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in A.P.

Proof: Since p, q, r are in G.P.

$\therefore q^2 = pr$

Now $px^2 + 2qx + r = 0$

$$\Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-2q \pm \sqrt{4q^2 - 4pr}}{2p}$$

$$= \frac{-2q \pm \sqrt{4q^2 - 4q^2}}{2p} \qquad [\because q^2 = pr]$$

$$= \frac{-2q}{2p} = -\frac{q}{p}$$

Since $x = -\frac{q}{p}$ $is\ also\ a\ root\ of\ equation$ $dx^2 + 2ex + f = 0$

$$\therefore d\left(-\frac{q}{p}\right)^2 + 2e\left(-\frac{q}{p}\right) + f = 0$$

$$\Rightarrow d\frac{q^2}{p^2} - 2e\frac{q}{p} + f = 0$$

$$\Rightarrow dq^2 - 2epq + fp^2 = 0$$

$$\Rightarrow dq^2 + fp^2 = 2epq$$

$$\Rightarrow \frac{dq^2+fp^2}{pq^2} = \frac{2epq}{pq^2} \qquad [dividing\ both\ sides\ by\ pq^2]$$

$$\Rightarrow \frac{dq^2}{pq^2} + \frac{fp^2}{pq^2} = \frac{2e}{q}$$

$$\Rightarrow \frac{d}{p} + \frac{fp}{q^2} = 2\frac{e}{q}$$

$$\Rightarrow \frac{d}{p} + \frac{fp}{pr} = 2\frac{e}{q} \qquad [\because q^2 = pr]$$

$$\Rightarrow \frac{d}{p} + \frac{f}{r} = 2\frac{e}{q}$$

Hence $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in A.P

2 .Find the sum to n terms the series: 5+11+19+29+41+.....

3.Find the sum of the first n term of the series 3+7+13+21+31+……..

4. In the arithmetic series 2,5,8,11…… upto 50 terms and 3,5,7,9…….. upto 60 terms, find how many terms are identical.

5. If S be the sum ,P the product and R the sum of reciprocals of n terms in a G.P. prove that $P^2 = \left(\frac{S}{R}\right)^n$

Proof: Let first term= a and common ratio= r

B/Q $S = a + ar + ar^2 + ar^3 + \cdots \ldots + ar^{n-1}$

$$= \frac{a(1-r^n)}{1-r}$$

$$P = a.ar.ar^2.ar^3 \ldots\ldots\ldots ar^{n-1}$$

$$= a^n r^{1+2+3+\cdots\ldots\ldots+(n-1)}$$

$$= a^n r^{\frac{n(n-1)}{2}}$$

$$R = \frac{1}{a} + \frac{1}{ar} + \frac{1}{ar^2} + \frac{1}{ar^3} + \cdots \ldots \ldots + \frac{1}{ar^{n-1}}$$

$$= \frac{\frac{1}{a}\left(1 - \frac{1}{r^n}\right)}{1 - \frac{1}{r}}$$

$$= \frac{r(r^n - 1)}{a(r-1)r^n}$$

$$= \frac{(1 - r^n)}{a(1-r)r^{n-1}}$$

$$= \frac{a(1 - r^n)}{(1-r)} \cdot \frac{1}{a^2 r^{n-1}}$$

$$= \frac{S}{a^2 r^{n-1}}$$

$$\Rightarrow \frac{S}{R} = a^2 r^{n-1}$$

$$\Rightarrow \left(\frac{S}{R}\right)^n = (a^2 r^{n-1})^n$$

$$\Rightarrow \left(\frac{S}{R}\right)^n = a^{2n} r^{n(n-1)}$$

$$\Rightarrow \left(\frac{S}{R}\right)^n = \left(a^n r^{\frac{n(n-1)}{2}}\right)^2$$

$$\Rightarrow \left(\frac{S}{R}\right)^n = P^2$$

6. The sum of n terms of two Arithmetic Progressions are in the ratio $(3n + 8) : (7n + 15)$. Find the ratio of their 12^{th} terms.

Sol:Let S_1= sum of n terms of first A.P.

S_2= sum of n terms of second A.P.

a_1 = first term of first A.P.

a_2 = first term of second A.P.

d_1 = C.D of first A.P.

d_2 = C.D of second A.P.

B/Q

$$\frac{S_1}{S_2} = \frac{3n + 8}{7n + 15}$$

$$\Rightarrow \quad \frac{\frac{n}{2}[2a_1 + (n-1)\, d_1]}{\frac{n}{2}[2a_2 + (n-1)\, d_2]} = \frac{3n + 8}{7n + 15}$$

$$\Rightarrow \quad \frac{[2a_1 + (n-1)\,d_1]}{[2a_2 + (n-1)\,d_2]} = \frac{3n+8}{7n+15}$$

$$\Rightarrow \quad \frac{a_1 + \frac{(n-1)}{2}\,d_1}{a_2 + \frac{(n-1)}{2}\,d_2} = \frac{3n+8}{7n+15}$$

$$\Rightarrow \quad \frac{a_1 + \frac{(23-1)}{2}\,d_1}{a_2 + \frac{(23-1)}{2}\,d_2} = \frac{3\times 23+8}{7\times 23+15} \qquad (putting\ n = 23\ both\ sides\ )$$

$$\Rightarrow \quad \frac{a_1 + 11\,d_1}{a_2 + 11\,d_2} = \frac{77}{176}$$

$\therefore$ The ratio of their 12^{th} terms is $77:176$

7.If a, b, c are in A.P; b, c, d are in G.P. and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in A.P. Prove that a, c, e are in G.P.

Proof: a, b, c are in A.P

$$\Rightarrow 2b = a + c$$

$$\Rightarrow b = \frac{a+c}{2} \qquad \rightarrow (1)$$

b, c, d are in G.P

$$\Rightarrow c^2 = bd \qquad \rightarrow (2)$$

$\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in A.P.

$$\Rightarrow 2\frac{1}{d} = \frac{1}{c} + \frac{1}{e}$$

$$\Rightarrow \frac{2}{d} = \frac{c+e}{ce}$$

$$\Rightarrow d = \frac{2ce}{c+e} \qquad \rightarrow (3)$$

Using (1) and (3) in (2) we get

$$c^2 = \frac{a+c}{2}\ \frac{2ce}{c+e}$$

$$\Rightarrow 2c^2(c+e) = 2ce(a+c)$$

$$\Rightarrow c(c+e) = e(a+c)$$

$$\Rightarrow c^2 + ce = ae + ce$$

$$\Rightarrow c^2 = ae$$

$\therefore$ $a, c, e\ are\ in$ G.P

8. If a, b are the roots of $x^2 - 3x + p = 0$ and c ,d are the roots of $x^2 - 12x + q = 0$,where a,b,c,d form a G.P. Prove that $(q+p) : (q-p) = 17 : 15$

9. Find the sum of the series up to n terms: $7 + 77 + 777 + \cdots$

Sol: $S_n = 7 + 77 + 777 + \cdots \ldots \ldots \ldots \ldots \ldots .. to\ n\ terms$

$= 7(1 + 11 + 111 + \cdots \ldots .. \text{to nterms})$

$= \frac{7}{9}(9 + 99 + 999 + \cdots \ldots .. to\ n\ terms)$

$= \frac{7}{9}[(10 - 1) + (100 - 1) + (1000 - 1) + \cdots \ldots to\ n\ terms]$

$= \frac{7}{9}[(10 - 1) + (10^2 - 1) + (10^3 -) + \cdots . to\ n\ terms]$

$= \frac{7}{9}[(10 + 10^2 + 10^3 + \cdots . to\ n\ terms) - (1 + 1 + 1 + \cdots to\ n\ terms)]$

$= \frac{7}{9}\left[\frac{10(1 - 10^n)}{1 - 10} - n\right]$

$= \frac{7}{9}\left[\frac{10}{-9}(1 - 10^n) - n\right]$

$= \frac{7}{9}\left[\frac{10}{9}(10^n - 1) - n\right]$

$= \frac{70}{81}(10^n - 1) - \frac{7n}{9}$

PHYSICS

SAINIK SCHOOL IMPHAL
SUMMER BREAK ASSIGNMENT
(2024-25)
CLASS : XI
SUB: PHYSICS

UNIT & DIMENSION:

1. Which one of the following pairs does not have the same dimensions?
(a) Potential energy and kinetic energy (b) Density and specific gravity
(c) Focal length and height (d) Gravitational force and frictional force

2. The value of which one of the following quantities remains same in all systems of units?
(a) Acceleration due to gravity (b) Specific gravity
(c) Pressure (d) Density

3. Which one of the following physical quantity has the same unit as that of pressure ?
(a) Angular momentum (b) Stress (c) Strain (d) Work

4. What do you meant by unit of a physical quantity?

5. What are the advantages of SI Unit over other system of units?

6. A physical quantity 'X' is measured with reference to the units 'A' and 'B', where A > B. In which unit 'X' will have higher numerical value? Explain your answer.

7. We have a relation between four different quantities as $W + X = Y + Z$. What can you say about the units of these quantities?

8. In a Vernier calliper, N divisions of vernier scale coincide with (N-1) divisions of main scale (in which one division represents 1 mm). Find the least count of the instrument (in cm).

9. In a slide calliper, (M+1) number of vernier divisions is equal to M number of smallest main scale divisions. If d units is the magnitude of the smallest main scale division, then find the magnitude of the vernier constant.

10. The length and breadth of a metal sheet are 3.124 m and 3.02 m respectively. Calculate the area of this sheet up to four correct significant figure.

11. Find the dimensions of $a \times b$ in the relation $P = \frac{a-t^2}{b\sqrt{x}}$, where *x* is distance, t is time and P is power.

12. If $v =$ velocity of a body and $c =$ speed of light. Write the dimensional formula of $\frac{v}{c}$.

13. In the relation $\alpha = \beta t + \lambda.$, α and λ are measured in metre (m) and t is measured is second (s). What is the S I Unit of β?

KINEMATICS

14. Draw a $v - t$ graph to represent a uniform motion. **15.** If a body travels half the distance with velocity v_1 and next half with velocity v_2 then which one of the following will be the average velocity of the body?

16. A body starting from the rest moves along a straight line with constant acceleration. Draw a velocity – time graph to represent the motion. What does the $v-$ intercept and slope of the graph represent?

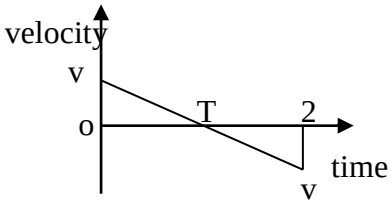
17. A car accelerates from rest with acceleration 1.2 m/s^2 as soon as the bus passes it. The bus moves with constant speed of 12 m/s in a parallel lane. How long does the car take from its start to meet the bus?

18. A bus moving at a speed of 24 m/s begins to slow at the rate of 3 m/s each second. How far does it go before stopping?

19. A stone is thrown vertically upwards with an initial velocity u from the top of a tower of height $12u^2/g$. With what velocity does the stone reach the ground?

20. A particle starts from rest, accelerates uniformly tor 3 seconds and then decelerates uniformly for 3 seconds and comes to rest. Draw a displacement (x) - time (t) graph to represent the motion of the particle.

21. The graph (velocity-time) shown represents motion of a particle.

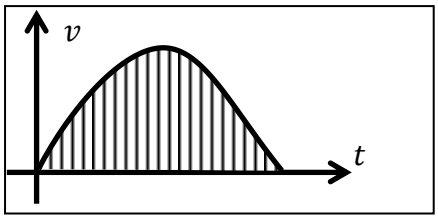


Draw acceleration-time graph for this motion.

22. A motorcycle, initially at rest, is given a constant acceleration for some time and then constant retardation b, till it comes to rest. If the total time elapsed is t seconds, what is the maximum velocity acquired by the motorcycle?

23. Let a particle A move from s = 0 at t = 0 along a straight line with an initial velocity v_1, and with a steady acceleration a_1 .Let a particle B move from s = 0 at t = 0 along the same straight line with an initial velocity v_2 and a steady acceleration a_2. If $v_1 < v_2$, and $a_1 > a_2$, then plot a $v-t$ graphs for these motions.

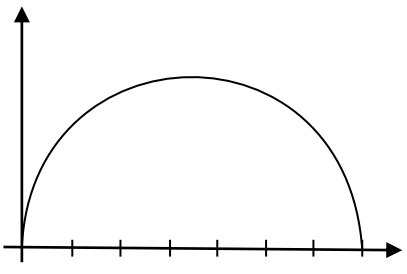
24.



Which characteristic of the particle does the shaded area of the velocity-time graph shown above represent ?

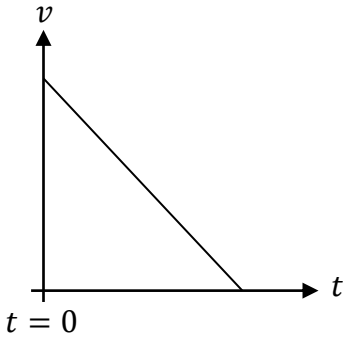
25. In a vacuum, a five-rupee coin, a feather of a sparrow bird and a mango are dropped simultaneously from the same height. The time taken by them to reach the bottom is t_1, t_2 and t_3 respectively. Find the relation among the time of fall.

26. The plot given below represents the velocity of a particle in (m/s) with time (in second).

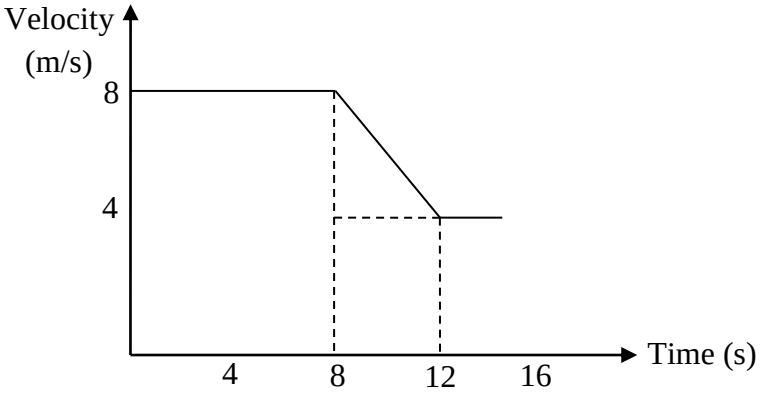


Assuming that the plot represents a semi-circle, find the distance traversed by the particle at the end of 7 seconds is approximately.

27. What type of motion is represented by the velocity – time plot shown below?

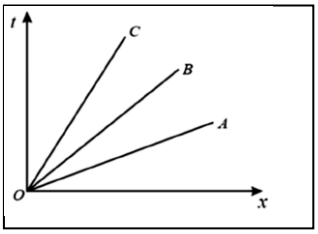


28. Consider the following velocity and time graph:



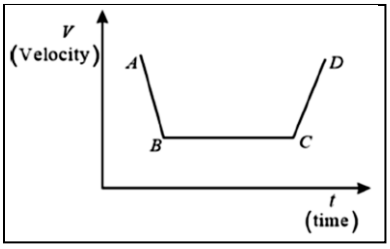
What is the average acceleration from 8 s to 12 s?

29. The figure shown above gives the time (t) versus position (x) graphs of three objects A, B and C.



Compare the velocities of these three objects.

30. In the given velocity (v) versus time (t) graph, which part of the graph represent the accelerated and decelerated motions.



CHEMISTRY

Summer Vacation Home Work

Chemistry XI

Unit 2: Atomic structure

1. Write short notes on Dalton's Atomic theory. Explain how Dalton's atomic theory failed with the discovery of subatomic particles like electrons, protons and neutrons etc.

2. Explain atomic model proposed by E. Rutherford after his infamous α- scattering experiment. What are the limitations of his atomic model which is disagreement with Maxwell's electromagnetic theory.

3. With the help of Postulates proposed by Neil Bohr, derive the mathematical expression for the radius and energy associated with an electron in the n^{th} orbit.

4. State Heisenberg's uncertainty principle. How this principle affects Bohr's concept of revolving electrons around the nucleus in a fixed circular orbit? How it is impossible to calculate both the momentum and position precisely of an electron in atom simultaneously?

5. What is electronic configuration? Write electronic configuration of atom of elements with atomic number from Z = 10 to Z = 30. Explain the factors which holds the stability of electronic configuration of atoms with exceptional electronic configuration.

6. Define photoelectric effect. Derive Eistein's photoelectric equation from the concept of work function. Also explain how kinetic energy of photoelectron is directly proportional to the frequency of the incoming electromagnetic radiation.

Unit 3: Classification of elements and Periodicity in properties.

1. Why do we need classification of elements in groups? Explain classification of elements in Groups and Periods in Long form of Periodic table is done based on the electronic configuration of atoms of elements.

2. Define ionisation enthalpy. Explain variation of ionisation enthalpy along a period from left to right and down a group from top to bottom with the affecting factors which suits the case.

3. Define electron gain enthalpy. Explain variation of electron gain enthalpy along a period from left to right and down a group from top to bottom with the affecting factors which suits the case.

4. How will explain atomic radii of atoms. Explain variation of atomic radii along a period from left to right and down a group from top to bottom with the affecting factors which suits the case.

END

Summer Vacation Home Work

BIOLOGY

BIOLOGY CLASS - XI

VACATION HOME ASSIGNMENT 2024 – 2025

CHAPTER 2

1. Diatoms are also called as ‘pearls of ocean’, why? What is diatomaceous earth?
2. Discuss the salient features of viruses with the help of diagram?
3. Explain the phylogenetic system of classification.
4. Find out what the terms ‘algal bloom’ and ‘red tides’ signify.
5. Explain sexual reproduction in bacteria.

CHAPTER 3

1. Both gymnosperms and angiosperms bear seeds but then why are they classified separately?
2. “Algae and Bryophytes are different from each other.” Point out the main differences between them?
3. Distinguish the reproductive organ of gymnosperm and angiosperm.

CHAPTER 4

1. What are the reasons that you can think of for the arthropods to constitute the largest group of the animal kingdom?
2. “All vertebrates are chordates but all chordates are not vertebrates”. Justify the statement.
3. Distinguish between diploblastic & triploblastic animals.
4. “All vertebrates are chordates but all chordates are not vertebrates” justify the statement.
5. “Mammals are the most successful & dominant animals today” Give evidence.

ENGLISH

SAINIK SCHOOL IMPHAL
SUMMER VACATION ASSIGNMENT
SESSION: 2024-25
ENGLISH CORE
CLASS: XI

BOOK REVIEW

A book review is written after you have read a book, and you feel that you cannot stop yourself from sharing your thoughts on the book. A book review is a great way of letting fellow readers know about the book — let your readers know if the book is exciting or boring. Whether writing on social media or on your personal blog, while reviewing the book, try to make it informative and helpful to the readers. Therefore, to help you write a good book review, I have provided a few tips. Read the tips given below and write a book review of your own.

Write a book review on the following novel:

"A TALE OF TWO CITIES" by CHARLES DICKENS

What to Include in the Book Review?

- Topic or Book
- Essential Information of the novelist
- Information about the novel
- Important characters in the novel
- Basic Summary
- Development of the Plot
- Conclusion
- Your Criticism or views of the novel
- Morale or the message given by the novel
- Recommendations
- Ratings

IMPORTANT NOTES:

(i) The assignment should be done on A4 size sheets and compiled in a hard bound file/folder. And design an attractive cover for your file/folder indicating Name, Class, Section, Adm. No. and Subject clearly.
(ii) All the answers should be neatly presented in your own handwriting.
(iii) Remember, a well-presented 'Holiday Homework' fetches you appreciations of the teachers and the classmates.

BE WITH YOUR PARENTS; STAY SAFE, STAY HAPPY.

MR. M A HAQUE
MASTER (ENGLISH)