☑ **General Instructions :** Same as given in YTS-01.

SECTION A

*(Question numbers 01 to 20 carry **1 mark** each.)*
*Followings are **multiple choice questions**. Select the correct option in each one of them.*

01. If A and B have respectively m and n number of elements then, the number of functions defined from A to B is
(a) $n^{m\times m}$ (b) m^n (c) n^m (d) $m^{n\times n}$

02. For $z=3-7i$, $\bar{z}=$
(a) $-3-7i$ (b) $3+7i$ (c) $-3+7i$ (d) $3i+7$

03. Set builder form for $A=\{0, 2, 10, 30, 68\}$, is
(a) $\{x : x=n^3+n,\ n\in Z-Z^-,\ n\le 5\}$ (b) $\{x : x=n^3-n,\ n\in Z-Z^-,\ n<5\}$
(c) $\{x : x=n^3-n,\ n\in Z-Z^-,\ n\le 5\}$ (d) $\{x : x=n^3+n,\ n\in Z-Z^-,\ n<5\}$

04. Let $3\sin A-4\sin^3 A=\sin\theta$ then, the value of θ is
(a) A (b) 3A (c) $\frac{A}{3}$ (d) 2A

05. Total number of three letters words formed using all the letters of the word "SHINE" is
(a) 60 (b) 120 (c) 24 (d) 20

06. Let $A=\{-1, 1, 2\}$ and $B=\{1, 4, 9, 10\}$. Let $a\,R\,b$ means $a^2=b$. Then roster form of R is given by
(a) $\{(1, 1), (2, 4)\}$ (b) $\{(-1, 1), (1, 1)\}$
(c) $\{(-1, 1), (1, 1), (2, 4)\}$ (d) $\{(2, 4)\}$

07. Least value of $4x+\frac{16}{x}$, $x>0$ is
(a) 8 (b) 4 (c) 64 (d) 16

08. Equation of line $2x+3y=24$ in the slope-intercept form is given by
(a) $\frac{x}{12}+\frac{y}{8}=1$ (b) $\frac{x}{12}+\frac{y}{8}+1=0$ (c) $y=-\frac{2}{3}x+8$ (d) $y=\frac{2}{3}x+8$

09. Which of the following set represents a finite set?
(a) Set of all the points on a line segment (b) $\{x : x\in N,\ x \text{ is prime}\}$
(c) Set of circles passing through the origin (d) Set of the real solutions of $x^2-81=0$

10. The value of ${}^{56}C_{56}$ is
(a) 6845872 (b) 0 (c) 56 (d) 1

11. Multiplicative inverse of $1-\sqrt{3}i$ is
(a) $1+\sqrt{3}i$ (b) $\frac{1}{4}-i\frac{\sqrt{3}}{4}$ (c) $\frac{1}{4}+i\frac{\sqrt{3}}{4}$ (d) $-1+\sqrt{3}i$

12. If $f(x)=x^3-5x^2+7$, then $f'(2)=$
(a) -5 (b) $3x^2-10x$ (c) 8 (d) -8

13. Domain of $f(x) = [x]$, where [.] represents greatest integer function, is $x \in$

(a) Z (b) Z^+ (c) R^+ (d) R

14. If the arcs of the same length in two circles subtend angles 65° and 110° at the centre, then the ratio of their radii is

(a) 22 : 13 (b) 22 : 12 (c) 13 : 36 (d) 7 : 13

15. Which of the following is correct formula for finding 'mean deviation about the median'?

(a) $\frac{\sum|x_i + \bar{x}|}{N}$ (b) $\frac{\sum f_i|x_i - \bar{x}|}{\sum f_i}$ (c) $\frac{\sum|x_i - M|}{N}$ (d) $\frac{\sum f_i|x_i + M|}{N}$

16. Value of $6^{\frac{1}{2}} \times 6^{\frac{1}{4}} \times 6^{\frac{1}{8}} \times \ldots$ upto ∞ is

(a) 6 (b) 36 (c) 216 (d) $\sqrt{6}$

17. $(A \cup B)' =$

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

18. One card is drawn from a well shuffled deck of 52 cards. If each outcome is equally likely, then the probability that the card will be 'not an ace' is?

(a) $\frac{1}{13}$ (b) $\frac{12}{13}$ (c) $\frac{1}{4}$ (d) $\frac{3}{4}$

*Followings are **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.

19. **Assertion (A) :** The distance between the points $(-1+\sqrt{13}, 2, 0)$ and $(-1, 0, 3)$ is $2\sqrt{13}$ units.

Reason (R) : Distance between any two points $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$ is $PQ = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2 + (z_2-z_1)^2}$.

20. **Assertion (A) :** Value of $\tan\left(-\frac{11\pi}{4}\right)$ is 1.

Reason (R) : $\sin(3\pi + \theta) = -\sin\theta$.

SECTION B

*(Question numbers 21 to 25 carry **2 marks** each.)*

21. Find a point on the x-axis which is at equal distance from the points P(0, 3, 2) and Q(5, 0, 4).

OR

Find the equation of the set of the points P such that its distances from the points M(2, 0, –5) and X(0, 1, 4) are equal.

22. Let $A = \{1, 2, 3\}$, $B = \{3, 4\}$ and $C = \{3, 6\}$.
Check if $A \times (B \cup C) = (A \times B) \cup (A \times C)$.

23. For what value of n, $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$ is the arithmetic mean of 'a' and 'b'?

OR

Insert four geometric means between 5 and 160.

24. Find the mean deviation about the mean for the data : 6, 7, 10, 12, 13, 4, 8, 12.

25. Find n, if ${}^{2n}C_3 : {}^nC_3 = 11 : 1$.

SECTION C

*(Question numbers 26 to 31 carry **3 marks** each.)*

26. Let A, B, and C be the sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$.
Then show that $B = C$.

OR

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?

27. Using binomial theorem, prove that $6^n - 5n$ always leaves remainder 1 when divided by 25.

28. Calculate the standard deviation for the following data :

C.I.	Frequency (f_i)
25-35	21
35-45	20
45-55	16
55-65	25
65-75	18

29. Express the given complex number in the form $a + ib$: $\left(\frac{1}{1-2i} + \frac{3}{1+i}\right)\left(\frac{3+4i}{2-4i}\right)$.
Also, write the additive inverse of resultant complex number.

OR

Let $z_1 = 2 - i$, $z_2 = 1 + i$ then, find the value of $\left|\frac{z_1 + z_2 + 1}{z_1 - z_2 + 1}\right|$.

30. Evaluate : $\lim_{x \to 0} \frac{\sec 4x - \sec 2x}{\sec 3x - \sec x}$.

31. Show that the equation of the straight lines passing through the origin and making an angle θ with the line $y = mx + c$ is $\frac{y}{x} = \frac{m \pm \tan\theta}{1 \mp m\tan\theta}$.

OR

Find the coordinates of the foot of perpendicular drawn from the point (2, 3) to the straight line is $y = 3x + 4$.

SECTION D

*(Question numbers 32 to 35 carry **5 marks** each.)*

32. Prove that $(\cos x + \cos y)^2 + (\sin x + \sin y)^2 = 4\cos^2\left(\frac{x-y}{2}\right)$.

OR

Prove that $\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$.

33. Find the lengths of the transverse and conjugate axes; the coordinates of foci and vertices; the eccentricity and the length of latus-rectum of hyperbola $y^2 - 16x^2 = 16$.

34. If $P(\text{not } A) = 0.7$, $P(B) = 0.7$ and $P(A \cap B) = 0.15$, then find $P(\bar{A} \cap \bar{B})$.
Also find $P(A \cap \bar{B})$ and $P(\bar{A} \cap B)$.

35. Solve : $\frac{x+3}{x-2} \le 2$.

OR

While drilling a hole in the earth, it was found that the temperature T (in °C) at x km below the surface of earth was given by : $T = 30 + 25(x - 3)$, when $3 \le x \le 15$. Between what depths will the temperature be between 200 °C and 300 °C?

SECTION E

*(Question numbers 36 to 38 carry **4 marks** each.)*
*This section contains **three Case-study / Passage based questions**.*
*First two questions have **three sub-parts** (i), (ii) and (iii) of **marks 1, 1 and 2** respectively.*
*Third question has **two sub-parts** of **2 marks** each.*

36. **CASE STUDY I :** Read the following passage and answer the questions given below.

There are five flags of different colors.
Rajnikant wants to put these flags over a vertical staff one below the other, in order to make different signals.

(i) If exactly 2 flags are used to make the signals, then how many signals can be generated?
(ii) If exactly 3 flags are used to make the signals, then how many signals can be generated?
(iii) Find the number of different signals that can be generated by arranging at least 3 flags on a vertical staff.

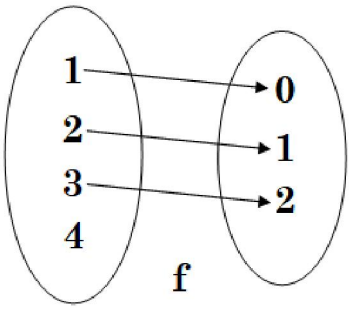
OR

(iii) Find the number of different signals that can be generated by arranging at most 3 flags on a vertical staff.

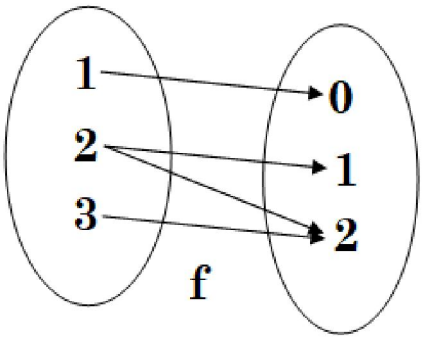
37. **CASE STUDY II :** Read the following passage and answer the questions given below.

Given a relation in x and y, we say 'y is a function of x' if for every element x in the domain, there corresponds exactly one element y in the range.

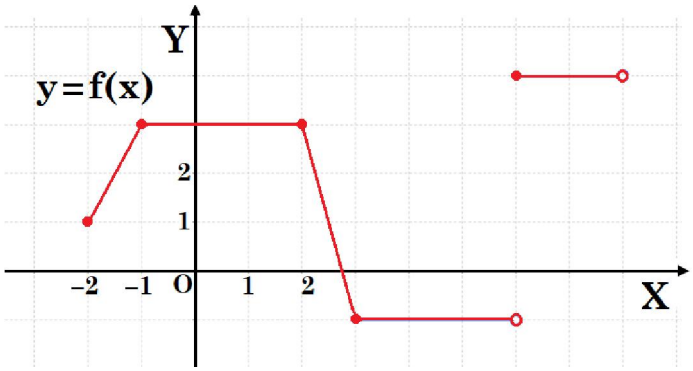
(i) Determine whether the following arrow diagram represents a function or not. Justify your answer.



(ii) Determine whether the following arrow diagram depicts a function or not. Give reason to support your answer.



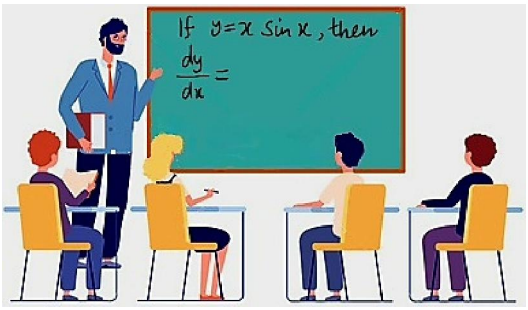
(iii) Determine the domain and range of the function $y = f(x)$, whose graph is shown below.



OR

(iii) Examine the graph shown above. Mention the integral value (s) of x, at which $f(x) = 3$.

38. **CASE STUDY III :** Read the following passage and answer the questions given below.



Mr Pandey taught Algebra of derivative of functions to his students in class XI.

Let $f(x)$ and $g(x)$ be two functions such that their derivatives i.e., $f'(x)$ and $g'(x)$ are defined in a common domain.

Then the Product rule of derivatives of the functions $f(x)$ and $g(x)$ is given by

$$\frac{d}{dx}[f(x).g(x)] = f(x).g'(x) + g(x).f'(x).$$

Also the Quotient rule of derivatives of the functions $f(x)$ and $g(x)$ is given by

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x).f'(x) - f(x).g'(x)}{[g(x)]^2}.$$

(i) Let $f(x) = x + 1$, $g(x) = x^2$. Find $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right]$, using Quotient rule.

(ii) Let $f(x) = x + \sec x$, $g(x) = x - \tan x$. Find $\frac{d}{dx}[f(x).g(x)]$, using Product rule.

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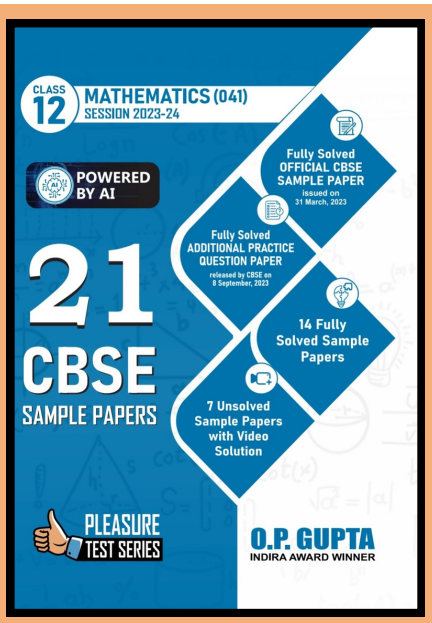

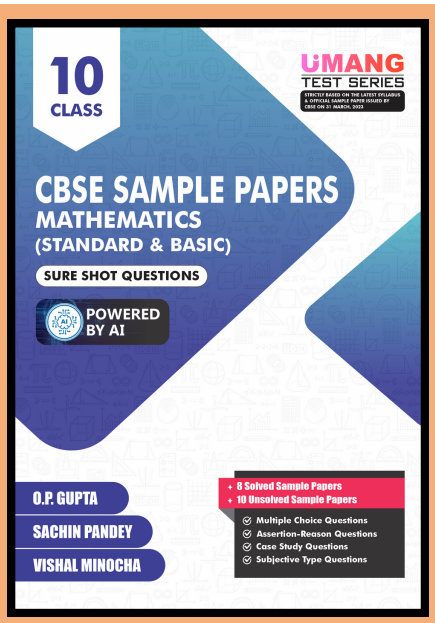

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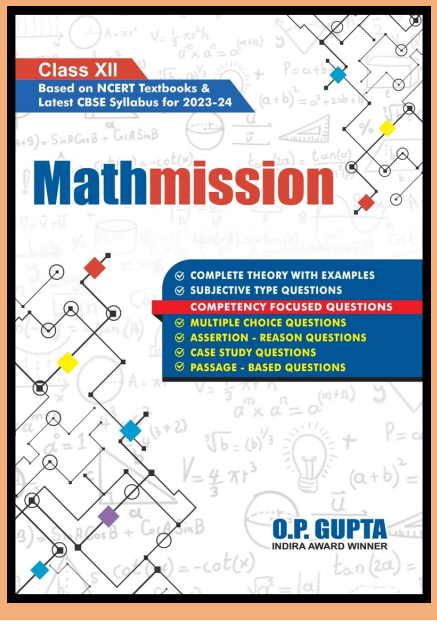

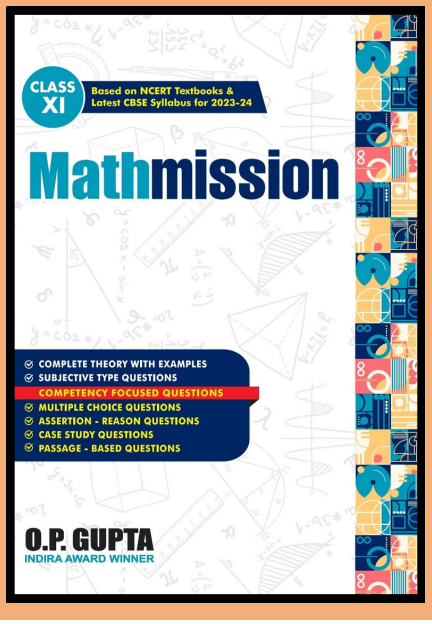

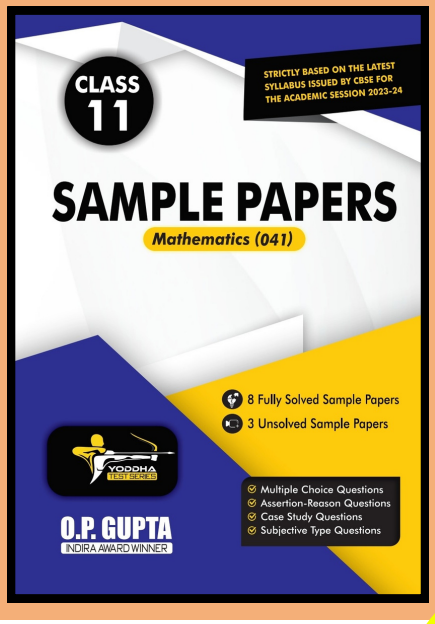

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