



Time Allowed: 3 hours

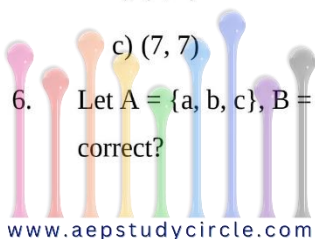
Maximum Marks: 80

General Instructions:

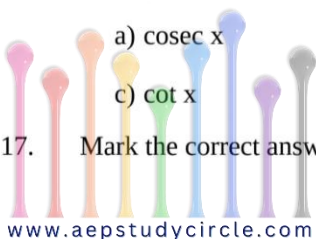
1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.

Section A

1. If $\sin \theta + \operatorname{cosec} \theta = 2$, then $\sin^2 \theta + \operatorname{cosec}^2 \theta$ is equal to [1]
 - a) 2
 - b) 1
 - c) 3
 - d) 4
2. Domain of definition of the function $f(x) = \frac{3}{4-x^2} + \log_{10}(x^3 - x)$ is [1]
 - a) $(-1, 0) \cup (1, 2) \cup (2, \infty)$
 - b) $(1, 2) \cup (2, \infty)$
 - c) $(-1, 0) \cup (1, 2)$
 - d) $(1, 2)$
3. Two cards are drawn successively without replacement from a well-shuffled pack of 52 cards. The probability of drawing two aces is [1]
 - a) $\frac{1}{221}$
 - b) $\frac{1}{26}$
 - c) $\frac{1}{13}$
 - d) $\frac{4}{223}$
4. $\lim_{x \rightarrow 0} \frac{\tan 2x - x}{3x - \sin x}$ is equal to [1]
 - a) $\frac{1}{2}$
 - b) 2
 - c) $\frac{1}{4}$
 - d) $-\frac{1}{2}$
5. The centroid of a triangle is (2, 7) and two of its vertices are (4, 8) and (-2, 6). The third vertex is [1]
 - a) (0, 0)
 - b) (4, 7)
 - c) (7, 7)
 - d) (7, 4)
6. Let $A = \{a, b, c\}$, $B = \{a, b\}$, $C = \{a, b, d\}$, $D = \{c, d\}$ and $E = \{d\}$. Then which of the following statement is not correct? [1]



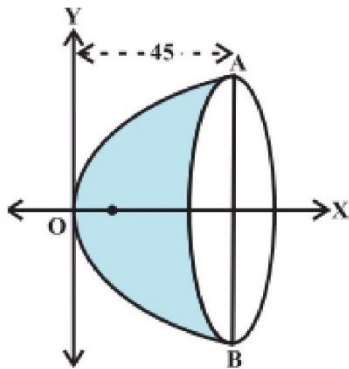
- a) $D \supseteq E$
 b) $C - B = E$
 c) $B \cup E = C$
 d) $C - D = E$ [1]
7. If $z = \left(\frac{1+i}{1-i}\right)$, then z^4 equals. [1]
 a) 0
 b) -1
 c) 2
 d) 1
8. Let R be a relation on N defined by $x + 2y = 8$. The domain of R is [1]
 a) {1, 2, 3, 4}
 b) {2, 4, 8}
 c) {2, 4, 6, 8}
 d) {2, 4, 6}
9. The solution set for $(x + 3) + 4 > -2x + 5$: [1]
 a) $(-\infty, 2)$
 b) $\left(\frac{-2}{3}, \infty\right)$
 c) $(-\infty, -2)$
 d) $(2, \infty)$
10. The radian measure of $50^\circ 37' 30''$ is [1]
 a) $\left(\frac{5\pi}{16}\right)^c$
 b) $\left(\frac{9\pi}{32}\right)^c$
 c) $\left(\frac{7\pi}{18}\right)^c$
 d) $\left(\frac{11\pi}{36}\right)^c$
11. If a set A has n elements then the total number of subsets of A is [1]
 a) 2n
 b) n
 c) 2^n
 d) n^2
12. $(3 + 6 + 12 + \dots + 1536) = ?$ [1]
 a) 1023
 b) 3069
 c) 2046
 d) 4092
13. $\{C_0 + 2C_1 + 3C_2 + \dots + (n + 1)C_n\} = ?$ [1]
 a) $(n + 1) \cdot 2^n$
 b) $(n + 2) \cdot 2^{n+1}$
 c) $(n + 2) \cdot 2^{n-1}$
 d) $n \cdot 2^{n-1}$
14. If $x < 5$, then [1]
 a) $-x > -5$
 b) none of these .
 c) $-x < 5$
 d) $x > -5$
15. For any two sets A and B, $A \cap (A \cup B) = \dots$ [1]
 a) $\neq \phi$
 b) B
 c) ϕ
 d) A
16. $\frac{1 - \cos 2x + \sin x}{\sin 2x + \cos x} = ?$ [1]
 a) cosec x
 b) sec x
 c) cot x
 d) tan x
17. Mark the correct answer for $(2 - 3i)(-3 + 4i) = ?$ [1]



- a) $(6 + 17i)$
b) $(-6 + 17i)$
c) $(6 - 15i)$
d) $(6 - 17i)$
18. ${}^{36}C_{34} = ?$ [1]
a) 610
b) 630
c) 1224
d) 612
19. **Assertion (A):** The expansion of $(1 + x)^n = nC_0 + nC_1x + nC_2x^2 + \dots + nC_nx^n$. [1]
Reason (R): If $x = -1$, then the above expansion is zero.
a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.
20. **Assertion (A):** The mean deviation about the mean for the data 4, 7, 8, 9, 10, 12, 13, 17 is 3. [1]
Reason (R): The mean deviation about the mean for the data 38, 70, 48, 40, 42, 55, 63, 46, 54, 44 is 8.5.
a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

Section B

21. Write the domain of the real function $f(x) = \frac{1}{\sqrt{|x|-x}}$ [2]
OR
Find the domain and range of the real function $f(x) = \sqrt{9 - x^2}$.
22. Differentiate $\frac{x}{\sin x}$ respect to x. [2]
23. The focus of a parabolic mirror as shown in is at a distance of 5 cm from its vertex. If the mirror is 45 cm deep, [2]
find the distance AB



OR

- Find the vertex, focus, axis, directrix and latus-rectum of the following parabolas $4x^2 + y = 0$.
24. Two sets A and B are, such that $n(A \cup B) = 21$, $n(A) = 10$, $n(B) = 15$, find $n(A \cap B)$ and $n(A - B)$. [2]
25. Find the angles between the pairs of straight lines $x - 4y = 3$ and $6x - y = 11$. [2]

Section C

26. Find the domain and range of the function $f(x) = \frac{x^2-9}{x-3}$ [3]
27. To receive Grade A, in a mathematics course, one must obtain an average of 90 marks or more in five examinations (each of 100 marks). If Ragini's marks in first four examinations are 87, 92, 94 and 95, find minimum marks that Ragini must obtain in fifth examination to get Grade A in the course. [3]

28. Find the point on the y-axis which is equidistant from the points A(3, 1, 2) and B(5, 5, 2). [3]

OR

Find the lengths of the medians of the triangle with vertices A (0, 0, 6), B (0, 4, 0) and C (6, 0, 0).

29. Using binomial theorem, expand: $\left(\frac{2x}{3} - \frac{3}{2x}\right)^6$ [3]

OR

Find $(a + b)^4 - (a - b)^4$. Hence, evaluate $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$

30. Express the complex number $\left(-2 - \frac{1}{3}i\right)^3$ in the form of a + ib. [3]

OR

Find the square root of $3 - 4i$

31. There are 200 individuals with a skin disorder, 120 had been exposed to the 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_2 or chemical C_1 . [3]

Section D

32. A bag contains 6 red, 4 white and 8 blue balls. If three balls are drawn at random, find the probability that: [5]
 i. one is red and two are white
 ii. two are blue and one is red
 iii. one is red.

33. Evaluate: $\lim_{x \rightarrow 2} \frac{x^3 + 3x^2 - 9x - 2}{x^3 - x - 6}$. [5]

OR

Differentiate $x^2 \sin x$ from first principle.

34. In an increasing GP, the sum of the first and last terms is 66, the product of the second and the last but one is 128 and the sum of the terms is 126. How many terms are there in this GP? [5]

35. Prove that: $\sin 6^\circ \sin 42^\circ \sin 66^\circ \sin 78^\circ = \frac{1}{16}$. [5]

OR

Prove that $\cos \frac{2\pi}{15} \cdot \cos \frac{4\pi}{15} \cdot \cos \frac{8\pi}{15} \cdot \cos \frac{16\pi}{15} = \frac{1}{16}$

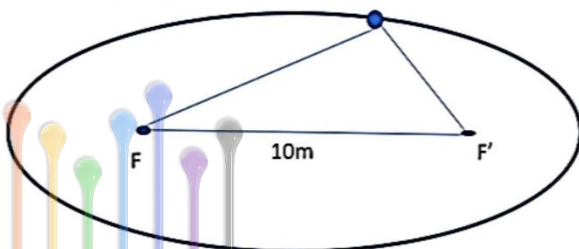
Section E

36. Read the following text carefully and answer the questions that follow: [4]

A farmer wishes to install 2 handpumps in his field for watering.



The farmer moves in the field while watering in such a way that the sum of distances between the farmer and each handpump is always 26m. Also, the distance between the hand pumps is 10 m.



- i. Name the curve traced by farmer and hence find the foci of curve. (1)
- ii. Find the equation of curve traced by farmer. (1)
- iii. Find the length of major axis, minor axis and eccentricity of curve along which farmer moves. (2)

OR

- iv. Find the length of latus rectum. (2)

37. **Read the following text carefully and answer the questions that follow:**

[4]

Consider the data.

Class	Frequency
0-10	6
10-20	7
20-30	15
30-40	16
40-50	4
50-60	2

- i. Find the mean deviation about median. (1)
- ii. Find the Median. (1)
- iii. Write the formula to calculate the Mean deviation about median? (2)

OR

Write the formula to calculate median? (2)

38. **Read the following text carefully and answer the questions that follow:**

[4]

The purpose of the student council is to give students an opportunity to develop leadership by organizing and carrying out school activities and service projects. Create an environment where every student can voice out their concern or need. Raju, Ravi Joseph, Sangeeta, Priya, Meena and Aman are members of student's council. There is a photo session in a school these 7 students are to be seated in a row for photo session.



- i. Find the total number of arrangements so that Raju and Ravi are at extreme positions? (1)
- ii. Find the number of arrangements so that Joseph is sitting in the middle. (1)
- iii. Find the number of arrangements so that three girls are together. (2)

OR

Find the number of arrangements so that Aman and Ravi are not together? (2)