विद्या सर्वार्थ साधिका

ANANDALAYA
ANNUAL EXAMINATION
Class: XI

Subject: Mathematics (041) M.M : 80
Date : 09 – 03 – 2024 Time : 3 Hours

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

(Multiple Choice Questions) Each question carries 1 mark

1. Taking the set of natural numbers as the universal set, which is the complement of the following sets: $\{x \in N : 2x + 5 = 9\}$? (1)

(A) $\{x: x = 4,\ x \in N\}$ (B) $\{x: x = 2,\ x \in N\}$
(C) $\{x: x < 2,\ x \in N\}$ (D) $\{x: x \neq 2, x \in N\}$

2. If the ordered pairs $(x - 1,\ y + 3) and\ (2,\ x + 4)$ are equal then value of x and y are ____. (1)

(A) $x = 3,\ \ y = 7$ (B) $x = 3,\ y = -4$
(C) $x = 3,\ \ y = 4$ (D) $x = 1,\ y = 3$

3. The domain of the real valued function $f(x) = \frac{1}{3x-2}$ is _____ (1)

(A) R (B) $R - \left\{\frac{2}{3}\right\}$ (C) $R - \left\{\frac{3}{2}\right\}$ (D) $R - (2, 3)$

4. If $tan\,\theta = 3$ and θ lies in the third quadrant, then the value of $sin\,\theta$ = _____. (1)

(A) $\frac{-3}{\sqrt{10}}$ (B) $-\frac{1}{\sqrt{10}}$ (C) $\frac{3}{\sqrt{10}}$ (D) $\frac{1}{\sqrt{10}}$

5. The value of $\frac{1-tan^2 15°}{1+tan^2 15°}$ = _____ (1)

(A) 1 (B) $\sqrt{3}$ (C) $\frac{\sqrt{3}}{2}$ (D) $\frac{2}{\sqrt{3}}$

6. A room has 9 doors. A man enters the room through one door and comes out through a different door. Then total number of ways equal to _____ (1)

(A) 8 (B) 81 (C) 64 (D) 72

7. Find the value of $cos\ 42°\ cos\ 12° + sin\ 42°\ sin\ 12°$ (1)

(A) $\frac{\sqrt{3}}{2}$ (B) $\frac{1}{2}$ (C) $\sqrt{3}$ (D) 1

8. Find the sum of infinite terms of the GP $\frac{-3}{4}, \frac{3}{16}, \frac{-3}{64} \ldots\ldots\ldots\ldots\ldots$ (1)

(A) $\frac{3}{5}$ (B) $\frac{5}{3}$ (C) $-\frac{3}{5}$ (D) $-\frac{5}{3}$

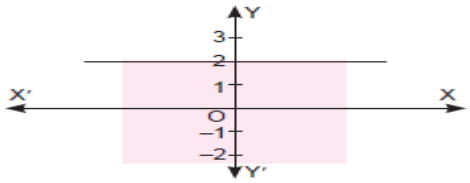
9 What is the number of terms in the expansion of $(a^2 - 2ab + b^2)^{10}$? (1)

(A) 20 (B) 21 (C) 11 (D) 10

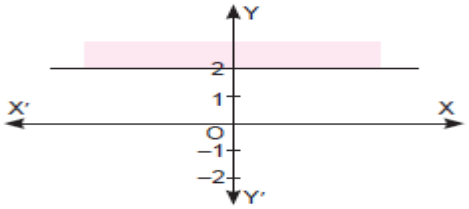
10 A line passes through the point (1, 5) and cuts off intercept of 7 units on x-axis. Find the slope of the line. (1)

(A) $\frac{5}{6}$ (B) $\frac{6}{5}$ (C) $-\frac{5}{6}$ (D) $-\frac{6}{5}$

11. Solution set of $y \leq 2$ graphically is _____. (1)



(A)



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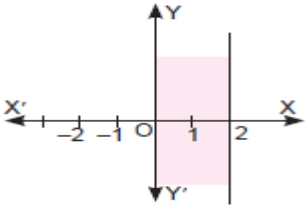

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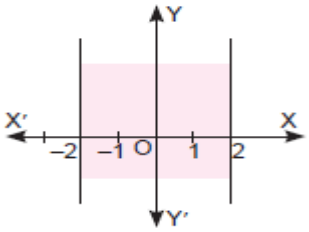


(D)

12. The equation of line $2x - 10y + 5 = 0$ in intercept form is: _____ (1)

(A) $-\frac{x}{\left(\frac{3}{2}\right)} - \frac{y}{\left(\frac{1}{2}\right)} = 1$ (B) $\frac{x}{\left(\frac{-5}{2}\right)} + \frac{y}{\left(\frac{1}{2}\right)} = 1$ (C) $\frac{x}{\left(\frac{5}{2}\right)} - \frac{y}{\left(\frac{1}{2}\right)} = 1$ (D) $\frac{x}{\left(\frac{1}{2}\right)} - \frac{y}{\left(\frac{5}{2}\right)} = 1$

13. What is the length of the latus rectum of the ellipse $16x^2 + y^2 = 16$? (1)

(A) $\frac{-1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) 2

14. Find the distance of the point $(1, -2, 4)$ from y - axis. (1)

(A) $\sqrt{17}$ (B) $\sqrt{20}$ (C) $\sqrt{5}$ (D) $\sqrt{10}$

15. If E and F are events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$, find $P(E \text{ or } F)$. (1)

(A) $\frac{4}{8}$ (B) $\frac{5}{8}$ (C) $\frac{2}{8}$ (D) $\frac{1}{4}$

16. Evaluate : $\lim_{x \to 0} \frac{x\tan 4x}{1-\cos 4x}$ (1)

(A) $\frac{-1}{2}$ (B) $-\frac{1}{4}$ (C) $\frac{1}{2}$ (D) 2

17 A bag contains 8 red and 5 white balls. Three balls are drawn at random. Find the probability that all the three balls are red. (1)

(A) $\frac{28}{143}$ (B) $\frac{25}{143}$ (C) $\frac{5}{8}$ (D) $\frac{8}{13}$

18 Find the conjugate of the complex number: $-3 + \sqrt{-1}$. (1)

(A) -3 (B) $-3 - i$ (C) $3 - i$ (D) $-3 + i$

In the following questions 19 and 20, 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 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.

19. **Assertion (A):** Let A = {1, 2} and B = {3, 4}, then the number of relations from A to B is 16. (1)
Reason (R) : If $n(A) = p \text{ and } n(B) = q$, then $n(A \times B) = pq$ and the total number of relations is 2^{pq}.

20. **Assertion (A):** If $nC_{12} = nC_8$, then $n = 20$ (1)
Reason (R) : If $nC_x = nC_y$ then either $x = y \text{ or } x + y = n$.

SECTION -B

This section comprises of very short answer type-questions (VSA) of 2 marks each

21. Find the domain and range of the relation R = $\{(x, x^2): x \leq 4,\ x \in N\}$. (2)

22. Solve: $5(2x - 7) - 3(2x + 3) \leq 0$ and $2x + 19 \leq 6x + 47$ and represent the solution on number line. (2)

23. How many words, with or without meaning can be made from the letters of the word MONDAY, assuming that no letter is repeated, if (2)
(*i*) 4 letters are used at a time and
(*ii*) All letters are used but first letter is a vowel?

OR

Find *n*, if : $\frac{(2n)!}{5!\,(2n-3)!} : \frac{n!}{4!(n-2)!} = 52 : 5$

24. If $y = e^{ax}\cos(bx + c)$, find $\frac{dy}{dx}$. (2)

25. A die is rolled. Let 'E' be the event "die shows prime number" and 'F' be the event "die shows even number". Are E and F mutually exclusive? (2)

OR

In a class of 25 students with roll numbers 1 to 25, a student is picked up at random to answer a question. Find the probability that the roll number of the selected student is either a multiple of 5 or 7.

SECTION- C

This section comprises of short answer type questions (SA) of 3 marks each.

26. If A = $\left\{x: x \in Z \text{ and } -1 < x < \frac{11}{2}\right\}$ $B = \{x: x \in Z \text{ and } x^2 \leq 4\}$, (3)

Find i) $A \cap B$ ii) $A - B$ iii) $B - A$

OR

Let $U = \{1, 2, 3, 4, 5, 6, 8\}$, $A = \{2, 3, 4\}, B = \{3, 4, 5\}$. Show that $(A \cup B)' = A' \cap B'$ and $(A \cap B)' = A' \cup B'$

27. Solve the following for x and y : (x – iy) (2 + 3i) = $\frac{x+2i}{1-i}$ (3)

28. Prove that: $\frac{sin5x - 2\,sin3x + sinx}{cos5x - cosx} = cosec2x - cot2x$ (3)

OR

Prove that: $cos2x\ cos\left(\frac{x}{2}\right) - cos3x\ cos\left(\frac{9x}{2}\right) = -sin5x\ sin\left(\frac{5x}{2}\right)$

29. Expand using binomial theorem: $\left(\sqrt{\frac{x}{a}} - \sqrt{\frac{a}{x}}\right)^6$. (3)

30. The foot of the perpendicular drawn from the point (2, 3) to a line is (3, – 1). Find the equation of the line. Also find the equation of a line parallel to the line and passing through the origin. (3)

31. 4 cards are drawn from a well-shuffled deck of 52 cards. What is the probability of obtaining 1 diamond and 3 spades? (3)

SECTION- D

(This section comprises of long answer-type questions (LA) of 5 marks each)

32. Find the derivative using first principle. $y = \frac{2x+3}{x-2}$ (5)

33. Find the value of *n*, so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be geometric mean between *a* and *b*. (5)

OR

Find the sum the following series up to *n* terms : $7 + 77 + 777 + \ldots\ldots\ldots\ldots$

34. Find the equation of the circle which passes through the points (2, – 2) and (3, 4) and whose centre lies on $x + y = 1$. (5)

OR

Find the equation of the set of all points such that the difference of their distances from (4, 0) and (– 4, 0) is always equal to 2.

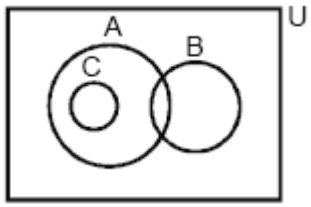
35. Find the mean and variance for the following frequency distribution : (5)

CLASSES	30 - 40	40 - 50	50 - 60	60 - 70	70 -80	80- 90	90-100
FREQUENCY	3	7	12	15	8	3	2

SECTION- E

This section comprises of 3 case- study/passage-based questions of 4 marks each with sub parts

36. In the given Venn diagram, if $n(U) = 100$, $n(A) = 60$, $n(B) = 48$, $n(A \cap B) = 22$ and $n(A \cap C) = 30$.



(i) Mark the number of elements in each region. (1)

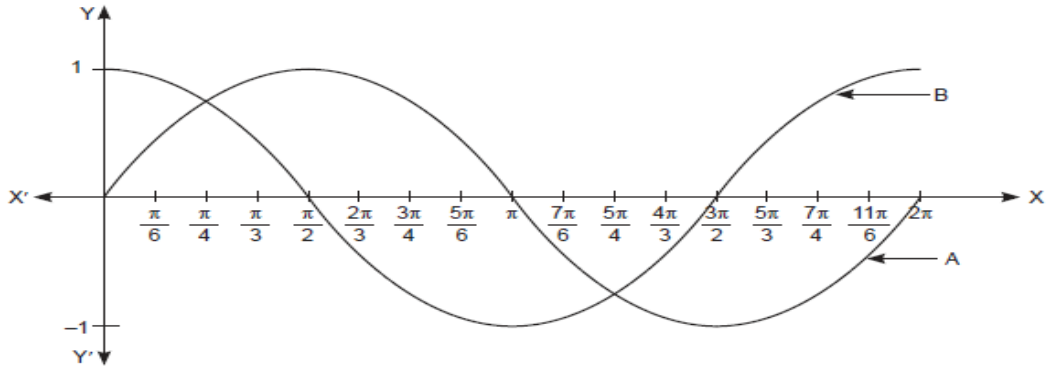
(ii) Find the value of $n(A \cup B)$ (1)

(iii) Find $n(B \cup C)$ (2)

OR

(iii) Find $n(B' \cap C')$

37. Observe the graph $x \in [0, 2\pi]$ carefully and answer the following:



(i) Graph A represents the graph of which trigonometric function. (1)

(ii) From the above graph write the value of x *if* $\sin x = 1$ (1)

(iii) Find the value of $sin^2\left(\frac{\pi}{6}\right) + cos^2\left(\frac{\pi}{3}\right) - tan^2\left(\frac{\pi}{4}\right)$. (2)

OR

(iii) From the graph find the angle for which the value of $\sin x$ *and* $\cos x$ is same and hence, find the value of $\sin x + \cos x$ for all values of $x \in [0, 2\pi]$.

38. A mobile number is having 10 digits. It is not just a group of numbers strung out at random. All mobile numbers have 3 things in common. a 2-digit Access Code (A Code), a 3-digit Provider Code (P Code), and a 5 digit Subscriber Code (S Code). A Code and P Code are fixed, then:

(i) How many mobile numbers are possible if number start with 98073 and no other digit can repeat? (1)

(ii) How many A Code are possible if both digit in A Code are different and must be greater than 6? (1)

(iii) How many mobile numbers are possible with A Code 98 and P Code 123 and digit used in A Code and P Code will not be used in S Code? (2)

OR

(iii) How many mobile numbers starting with 98073 are possible which are divisible by 5 and all digits can be used only once?