विद्या सर्वार्थ साधिका

ANANDALAYA
ANNUAL EXAMINATION
Class : XI

Subject: Mathematics M.M: 80
Date : 22/02/2020 Time: 3 Hours

General Instructions:
(i) All the questions are compulsory.
(ii) The question paper consists of 36 questions divided into 4 sections A, B, C, and D.
(iii) Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 6 questions of 4 marks each. Section D comprises of 4 questions of 6 marks each.
(iv) There is no overall choice. However, an internal choice has been provided in three questions of 1 mark each, two questions of 2 marks each, two questions of 4 marks each, and two questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.
(v) Use of calculators is not permitted.

SECTION-A

Q. 1 to Q.10 are multiple choce type questions. Select the correct option.

1. If the ordered pairs $(x-1, y+3) and\ (2, x+4)$ are equal then the values of x and y are ____. (1)
(a) x = 4, y = 3 (b) x = 3, y = 3 (c) x = 3 , y = 4 (d) x = 4, y = 4

2. A sum of ` 6240 is paid off in 30 installments, such that each installment is ` 10 more than the preceding installment. What is the value of the first installment? (1)
(a) 126 (b) 240 (c) 63 (d) 120

3. Consider the following sets: (1)
A = {1, 4}, B = {1, 4, 5, 9} and C = {1, 2, 3, 4, 5, 7, 9}, then $A \cup B$_____ C
(a) $\in$ (b) $\subset$ (c) $\notin$ (d) $\not\subset$

4. If the distance between foci of an ellipse is 6 and length of minor axis is 8, so eccentricity (e) ___. (1)
(a) 3/5 (b) 1/5 (c) 2/5 (d) 3/4

5. What is the length of the perpendicular form the point P (3, 4, 5) on y – axis? (1)
(a) $\sqrt{3}$ (b) $\sqrt{34}$ (c) 4 (d) 5

6. What is the probability that a leap year, selected at random, will contain 53 Sundays or 53 Mondays? (1)
(a) 3/7 (b) 1/7 (c) 0 (d) 4/7

7. What is the value if a and b if $(1+i)^6 + (1-i)^3 = a + ib$. (1)
(a) a = – 2 , b = – 10 (b) a = – 2, b = – 10 (c) a = 2, b = – 10 (d) a = 2, b = 10

8. $\lim_{x\to 0} \frac{\tan 8x}{\sin 3x} =$ _____. (1)
(a) 3/8 (b) 1 (c) 8/3 (d) 4/3

9. Value of $\tan\frac{13\pi}{12} =$ _____. (1)
(a) $\sqrt{3} - 2$ (b) $\sqrt{3}$ (c) $4 + \sqrt{3}$ (d) $2 - \sqrt{3}$

10. What is the total number of arrangements which can be made from the letters of the word 'INDEPENDENCE' such that words start with I and end with P. (1)
(a) 12600 (b) 24000 (c) 1663200 (d) 16800

Q. 11 to Q. 15 fill in the blanks

11. If the angles of a triangle are in the ratio 3 : 4 : 5, the greatest angle in radians is _____. (1)

12. If ${}^{10}P_{r+1} : {}^{11}P_r = 30 : 11$ then the value of r is _____. (1)

13. YZ – plane divides the line segment joining the points A (– 2, 4, 7) and B (3, – 5, 8) in ____ratio. (1)

14. If $R_1 = \{(x, y): y = 2x + 7$, where $x \in R$ and $-5 \leq x \leq 5\}$, then the range of R_1 is _____ (1)

OR

Let A = {9, 10, 11, 12, 13} and let f: A → N be defined by f(x) = the highest prime factor of x, $x \in A$. then the range of the function f is_____.

15. Total number of terms in the expansion of $(1 + 2x + x^2)^{11}$ is _____. (1)

OR

In the expansion of $\left(2x^2 - \frac{3}{x}\right)^{11}$, r^{th} term is containing x^{10}, then the value of r is _____.

Q. 16 to Q. 20 Answer the following questions.

16. While shuffling a pack of 52 cards, 2 cards are accidently dropped. Find the probability that the missing cards are of different colours. (1)

17. If n (A – B) = 10, n (B – A) = 8 and n ($A \cap B$) = 3, find n ($A \cup B$). (1)

18. Solve the given inequality and show it on number line: (1)

$$2y - 3 < y + 2 \leq y + 5.$$

OR

Find all pair of consecutive odd positive integers, both of which are smaller than 10 such that their sum is more than 11.

19. If origin is the centroid of a triangle ABC having vertices A (a, 1, 3), B (– 2, b, – 5) and C (4, 7 ,c), then find the values of a, b and c. (1)

20. If tan x = – 5/12 and x lies in the second quadrant, find the value of cosec x. (1)

SECTION-B

21. A bag contains six white marbles and five red marbles. Find the number of ways in which four marbles can be drawn from the bag if (i) they can be of any colour. (ii) two must be white and two must be red. (2)

OR

How many numbers greater than 50000 can be formed by using the digits 0, 2, 3, 5 and 6, each digit is used only once in each number?

22. If $f(x) = x^2 - 3x + 1$, find the value of $x \in R$ such that $f(2x) = f(x)$. (2)

23. Find the fourth term from the end in the expansion of $\left(\frac{3}{x^2} - \frac{x^3}{3}\right)^9$. (2)

24. If the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ passes through the points$(3, 0)$ and $(3\sqrt{2}, 2)$, then find its eccentricity. (2)

OR

Find the coordinates of focus and the length of latus-rectum of the conic represented by the equation $5x^2 = -12y$.

25. Write the Converse and equivalent Contrapositive of the following statement: (2)

'If a number n is even, then n^2 is even'

26. Find the probability of at most two tails or at least two heads in a toss of three coins. (2)

SECTION – C

27. Solve the following system of inequalities graphically: (4)

$$2x + y \leq 24, \quad x + y < 11, \quad 2x + 5y \leq 40, \quad x > 0, y \geq 0.$$

28. Prove by mathematical induction, that $5^n - 5$ *is divisible by* 4 *for all* $n \in N$. (4)

OR

Prove by Mathematical induction,

$$\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + \cdots \ldots \ldots \ldots \frac{n(n+3)}{n(n+1)(n+2)} = \frac{n(n+3)}{4(n+1)(n+2)}.$$

29. Find the domain and range of the following functions: (4)

(a) $f(x) = \sqrt{x+1}$ (b) $f(x) = \frac{1}{\sqrt{4-x}}$

30. For any triangle ABC prove that $\tan\left(\frac{B-C}{2}\right) = \frac{b-c}{b+c} \cot\frac{A}{2}$. (4)

31. If $y = \sqrt{\frac{x}{a}} + \sqrt{\frac{a}{x}}$, prove that $2xy\frac{dy}{dx} = \frac{x}{a} - \frac{a}{x}$. (4)

OR

If $f(x) = \frac{x \sin x}{1+\cos x}$, *find* $f'\left(\frac{\pi}{2}\right)$.

32. Find the equation of line parallel to y – axis and drawn through the point of intersection of the line $x - 7y + 5 = 0 and\ 3x + y = 0$. (4)

SECTION-D

33. Calculate the variance for the following distribution giving the age distribution of persons: (6)

Age in years	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Number of persons	3	61	132	153	140	51	2

OR

Find the mean deviation about the median for the following data:

Marks	0 - 10	10 - 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of girls	8	10	10	16	4	2

34. (a) If A and B are two sets and U is the universal set such that $n(U) = 700, n(A) = 290$, $n(B) = 240$ and $n(A \cap B) = 110$, then find $n(A' \cap B')$. (6)

(b) In class XI of a certain school, there are 20 students in chemistry class and 30 students in a physics class. Find the number of students which are either in chemistry or in physics class if the two classes meet at the same hour.

35 IF z_1, z_2 are complex numbers such that $\left|\frac{z_1 - 3z_2}{3 - z_1\bar{z}_2}\right| = 1 \ and\ |z_2| \neq 1, then\ find\ |z_1|$. (6)

OR

(a) If $z_1 = 2 - i \ and\ \ z_2 = 1 + i, find\ \left|\frac{z_1 + z_2 + 1}{z_1 - z_2 + i}\right|$.

(b) Find two numbers such that their sum is 6 and the product is 14.

36. If the A.M. and G.M. between two numbers are in the ratio m : n, then prove that the numbers are in the ratio $m + \sqrt{m^2 - n^2} : m - \sqrt{m^2 - n^2}$. (6)