



Roll No.	
Name	
Class & Section	

APEEJAY COMMON ANNUAL EXAMINATION, 2019-20

MATHEMATICS

Time Allowed : 3.00 Hrs.

Class – XI

Maximum Marks : 80

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.
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

1. If A and B are two disjoint sets, then $n(A \cup B)$ is equal to
 - (a) $n(A) + n(B)$
 - (b) $n(A) + n(B) - n(A \cap B)$
 - (c) $n(A) + n(B) + n(A \cap B)$
 - (d) $n(A) \cdot n(B)$
2. The value of $(1+i)(1+i^2)(1+i^3)(1+i^4)$ is
 - (a) 2
 - (b) 0
 - (c) 1
 - (d) -1
3. If $|x+2| \leq 9$, then
 - (a) $x \in (-7, 11)$
 - (b) $x \in [-11, 7]$
 - (c) $x \in (-\infty, -7]$
 - (d) $x \in (-\infty, 7) \cup (11, \infty)$

4. A coin is tossed. If head comes up, a dice is thrown, but if tail comes up, the coin is tossed again. Find the probability of getting head and an even number.

(a) $\frac{7}{8}$

(b) $\frac{3}{5}$

(c) $\frac{3}{4}$

(d) $\frac{3}{8}$

5. The distance of the point (3, 3, 4) from x-axis is

(a) $\sqrt{22}$

(b) 3

(c) 5

(d) 4

6. Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Then the number of subsets of A containing exactly two elements is

(a) 20

(b) 40

(c) 45

(d) 90

7. The sum to infinity of the following series

6, 1.2, 0.24, is

(a) 7

(b) 7.7

(c) 7.5

(d) 6.5

8. $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x}$ is equal to

(a) $2 \sin x$

(b) $\cos 2x$

(c) $\tan 3x$

(d) $\operatorname{cosec} 2x$

9. Distance between the straight lines $6x + 8y + 15 = 0$ and $3x + 4y + 9 = 0$ is

(a) $\frac{3}{10}$ units

(b) $\frac{5}{13}$ units

(c) $\frac{2}{7}$ units

(d) $\frac{4}{11}$ units

10. Let R be a relation on N, defined by $x + 2y = 8$. The domain of R is

(a) {1, 2, 3, 4}

(b) {2, 4, 6, 8}

(c) {2, 4, 8}

(d) {2, 4, 6}

11. The foci of the conic $2x^2 - 3y^2 = 5$ are &

12. If 6 boys and 6 girls sit in a row at random, then the probability that all the girls sit together is

13. In the expansion of $\left(\sqrt[3]{x} + \frac{1}{2\sqrt[3]{x}}\right)^{18}$, term number is independent of x .

OR

The coefficient of x^{-3} in the expansion of $\left(x - \frac{m}{x}\right)^{11}$ is

- 14. If the sum of n terms of an A.P. is $3n^2 + 5n$, then 164 is term.
- 15. If the arcs of same length in two circles subtend angles 65° and 110° at the centre, then the ratio of the radii of the circles is
- 16. Find x and y if $(x + y, 2) = (3, 2x + y)$.
- 17. There are 12 points in a plane, out of which 5 points are collinear. Find the number of straight lines that can be drawn joining them.

OR

How many numbers are there between 100 and 1000 such that none of their digits is 7.

- 18. Write contrapositive of the statement 'If a number is divisible by 9, then it is divisible by 3'.
- 19. Write the negative of the following statements :
 - (a) All integers are not rational numbers.
 - (b) 6 is divisible by 2 and 3.
- 20. Find the equation of the circle which touches Y-axis and has centre at (2, 3).

OR

Find the equation of parabola with vertex at origin, symmetric with Y-axis and passing through (2, -3)

Section-B

(2 marks each)

21. If $\cos \frac{x}{2} = -\frac{1}{\sqrt{10}}$, $\frac{\pi}{2} < \frac{x}{2} < \frac{3\pi}{4}$ find $\cos x$.

OR

Prove that : $\frac{\cos 8^\circ - \sin 8^\circ}{\cos 8^\circ + \sin 8^\circ} = \tan 37^\circ$

22. Find the domain and range of the following function :

$$f(x) = \sqrt{16 - x^2}$$

23. Differentiate $\frac{x^2 + x \sin x}{x + \cos x}$ w.r.t. x .

OR

Differentiate $f(x) = x^3 + 27$ by 1st principle.

24. Find the probability of atmost two tails or at least two heads in a toss of three coins.

25. Evaluate :

$$\lim_{x \rightarrow \pi/2} \frac{1 - \sin x}{\left(\frac{\pi}{2} - x\right) \cos x}$$

26. Evaluate :

$$\frac{\cot^2 15^\circ - 1}{\cot^2 15^\circ + 1}$$

Section-C

(4 marks each)

27. Prove that $7^{2n} + 2^{3n-3} \cdot 3^{n-1}$ is divisible by 25 for all $n \in N$ by mathematical induction.

OR

For all $n \in N$, prove that :

$$3 \cdot 2^2 + 3^2 \cdot 2^3 + 3^3 \cdot 2^4 + \dots + 3^n \cdot 2^{n+1} = \frac{12(6^n - 1)}{5}$$

28. 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 H and T, 8 read both T and I, 3 read all the newspapers. Find :

(i) The number of people who read at least one of these three newspapers.

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

29. Find n in the binomial expansion of $\left(\sqrt[3]{2} + \frac{1}{\sqrt[3]{3}}\right)^n$, if the ratio of 7th term from the beginning to the 7th term from the end is $\frac{1}{6}$.

30. The sum of three numbers in a G.P. is 56. If we subtract 1, 7, 21 from these numbers in that order, we obtain an A.P. Find the numbers.
31. Solve the following system of inequations graphically

$$4x + 3y \leq 60, \quad y \geq 2x, \quad x \geq 3, \quad y \geq 0$$

OR

A manufacturer has 600 litres of 2% solution of acid. How many litres of 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%.

32. Find modulus, argument, multiplicative inverse and polar form of : $z = \frac{1}{1+i}$.

Section-D

(6 marks each)

33. (a) The mean and variance of 7 observations are 8 and 16 respectively. If five of the observations are 2, 4, 10, 12 and 14, find the remaining two observations.
- (b) The probability that a person will get an electric contract is $\frac{2}{5}$ and the probability that he will not get plumbing contract is $\frac{4}{7}$. If the probability of getting at least one contract is $\frac{2}{3}$, what is the probability that he will get both the contracts. (4+2)

OR

- (a) Find the mean and variance for the following distribution :

Class interval	Frequency
30-40	3
40-50	7
50-60	12
60-70	15
70-80	8
80-9	3
90-100	2

- (b) Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that you both enter in the same section. (4+2)

34. (a) Find the distance of the point (2, 5) from the line $3x + y + 4 = 0$ measured parallel to the line $3x - 4y + 8 = 0$.

- (b) A rod AB of length 15 cm rests in between two coordinate axes in such a way that the end point A lies on X axis and the end point B lies on Y axis. A point P is taken on the rod in such a way that $AP = 6$ cm. Show that the locus of P is an ellipse. Find its eccentricity. (3+3)

OR

(a) The line $2x - 3y - 4 = 0$ is perpendicular bisector of the line segment AB and the co-ordinate of A is $(-3, 1)$. Find the co-ordinate of point B .

(b) An arc is in the form of a semi-ellipse. It is 8 m wide and 2 m high at the centre. Find the height of the arc at a point 1.5 cm from one end. (3+3)

35. (a) Find the sum of n terms of the series

$$3 + 15 + 35 + 63 + \dots$$

(b) If $\tan \beta = \frac{\tan \alpha + \tan \gamma}{1 + \tan \alpha \cdot \tan \gamma}$

then prove that $\sin 2\beta = \frac{\sin 2\alpha + \sin 2\gamma}{1 + \sin 2\alpha \cdot \sin 2\gamma}$ (4+2)

36. (a) Solve the following equation for x

$$\sqrt{3} \cos x + \sin x = \sqrt{2}$$

(b) Prove that :

$$\cos^2 x + \cos^2 \left(x + \frac{\pi}{3} \right) + \cos^2 \left(x - \frac{\pi}{3} \right) = \frac{3}{2} \quad (3+3)$$