General Instructions :

Read the following instructions very carefully and strictly follow them :

(i) This question paper comprises *four* sections – A, B, C and D. This question paper carries 40 questions. *All* questions are compulsory.

(ii) **Section A** – Question no. *1* to *20* comprises of *20* questions of *one* mark each.

(iii) **Section B** – Question no. *21* to *26* comprises of *6* questions of *two* marks each.

(iv) **Section C** – Question no. *27* to *34* comprises of *8* questions of *three* marks each.

(v) **Section D** – Question no. *35* to *40* comprises of *6* questions of *four* marks each.

(vi) There is no overall choice in the question paper. However, an internal choice has been provided in 2 questions of one mark each, 2 questions of two marks each, 3 questions of three marks each and 3 questions of four marks each. You have to attempt only *one* of the choices in such questions.

(vii) In addition to this, separate instructions are given with each section and question, wherever necessary.

(viii) Use of calculators is not permitted.

Section – A

Question numbers **1** to **10** are multiple choice questions of **1** mark each. You have to select the correct choice :

1. In fig. 1, the graph of the polynomial $p(x)$ is given. The number of zeroes of the polynomial is
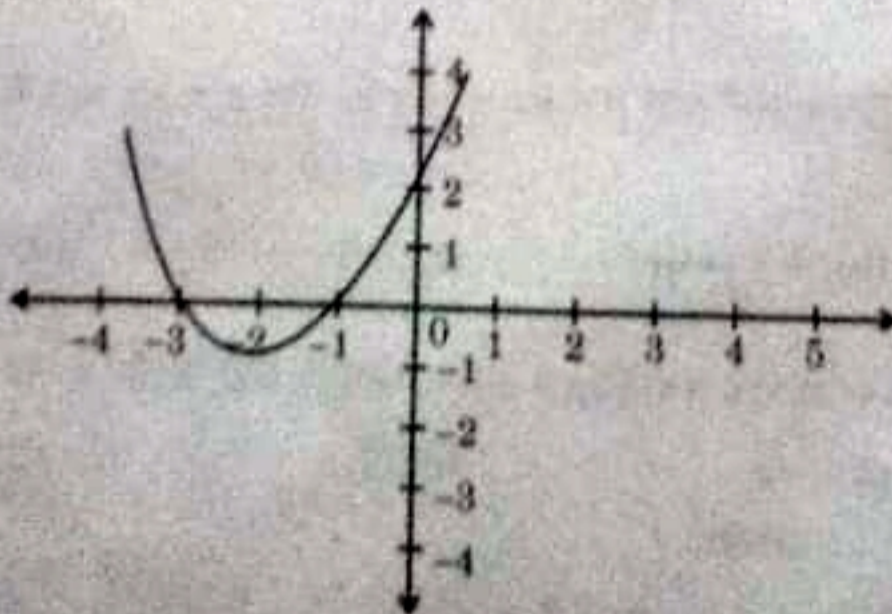

Fig. 1

(a) 1

(b) 2

(c) 3

(d) 0

3

2. If (a, b) is the mid-point of the line segment joining the points A(10, −6) and B(k, 4) and a − 2b = 18, the value of k is

(a) 30   (b) 22   (c) 4   (d) 40

3. The value of k for which the points A (0, 1), B (2, k) and C(4, −5) are collinear is

(a) 2   (b) −2   (c) 0   (d) 4

4. If $\triangle ABC \sim \triangle DEF$ such that AB = 1.2 cm and DE = 1.4 cm, the ratio of the areas of $\triangle ABC$ and $\triangle DEF$ is

(a) 49 : 36   (b) 6 : 7   (c) 7 : 6   (d) 36 : 49

5. The HCF of 135 and 225 is

(a) 15   (b) 75   (c) 45   (d) 5

6. The exponent of 2 in the prime factorization of 144, is

(a) 2   (b) 4   (c) 1   (d) 6

7. The common difference of an AP, whose n^{th} term is $a_n = (3n + 7)$, is

(a) 3   (b) 7   (c) 10   (d) 6

8. The value of λ for which $(x^2 + 4x + \lambda)$ is a perfect square, is

(a) 16   (b) 9   (c) 1   (d) 4

9. The value of k, for which the pair of linear equations $kx + y = k^2$ and $x + ky = 1$ have infinitely many solutions is

(a) ± 1   (b) 1   (c) −1   (d) 2

10. The value of p for which (2p + 1), 10 and (5p + 5) are three consecutive terms of an AP is

(a) −1   (b) −2   (c) 1   (d) 2

OR

The number of terms of an AP 5, 9, 13, ... 185 is

(a) 31   (b) 51   (c) 41   (d) 40

P.T.O.

11. $\dfrac{2\tan 60^\circ}{\tan 30^\circ} - \dfrac{1}{2}\left(\dfrac{\cos 30^\circ}{\sin 55^\circ}\right) =$ _____

12. In Fig. 2, PA and PB are tangents to the circle with centre O such that $\angle APB = 50^\circ$, then the measure of $\angle OAB$ is _____
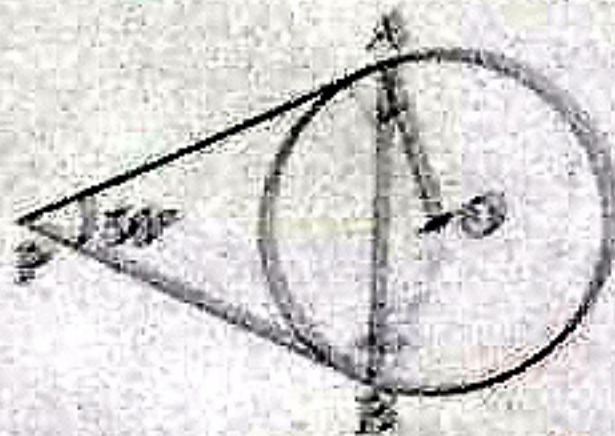

Fig. 2

OR

In Fig. 3, PQ is a chord of a circle and PT is tangent at P such that $\angle QPT = 60^\circ$, then the measure of $\angle PRQ$ is _____

Fig. 3

13. The distance between two parallel tangents of a circle of radius 4 cm is _____

14. The distance between the points $\left(-\dfrac{8}{5}, 2\right)$ and $\left(\dfrac{2}{5}, 2\right)$ is _____

15. If tan A = cot B, then A + B = _____

P.T.O.

Q. Nos. 16 to 20 are short answer type questions of 1 mark each.

16. What is the arithmetic mean of first n natural numbers ?

17. The probability that it will rain tomorrow is 0.85. What is the probability that it will not rain tomorrow ?

18. Using the empirical formula, find the mode of a distribution whose mean is 8.32 and the median is 8.05.

19. Two right circular cones have their heights in the ratio $1 : 3$ and radii in the ratio $3 : 1$, what is the ratio of their volumes ?

20. If $x = a \sin \theta$ and $y = b \cos \theta$, write the value of $(b^2 x^2 + a^2 y^2)$.

Section – B

Q. Nos. 21 to 26 carry 2 marks each.

21. Read the following passage and answer the questions given at the end :

Students of Class XII presented a gift to their school in the form of an electric lamp in the shape of a glass hemispherical base surmounted by a metallic cylindrical top of same radius 21 cm and height 3.5 cm. The top was silver coated and the glass surface was painted red.

(i) What is the cost of silver coating the top at the rate of ₹ 5 per 100 cm² ?

(ii) What is the surface area of glass to be painted red ?

22. If $\tan \theta = \dfrac{3}{4}$, find the value of $\left(\dfrac{1 - \cos^2 \theta}{1 + \cos^2 \theta} \right)$

OR

If $\tan \theta = \sqrt{3}$, find the value of $\left(\dfrac{2 \sec \theta}{1 + \tan^2 \theta} \right)$

23. Find the 11th term from the last term (towards the first term) of the AP 12, 8, 4, ..., –84.

OR

Solve the equation :

$1 + 5 + 9 + 13 + ... + x = 1326$

24. Find the value of p, if the mean of the following distribution is 7·5.

Classes	2-4	4-6	6-8	8-10	10-12	12-14
Frequency (f)	6	8	15	p	8	4

25. In a family of 3 children, find the probability of having at least one boy.

26. In Fig. 4, PA is a tangent from an external point P to a circle with centre O. If $\angle POB = 115°$, find $\angle APO$.
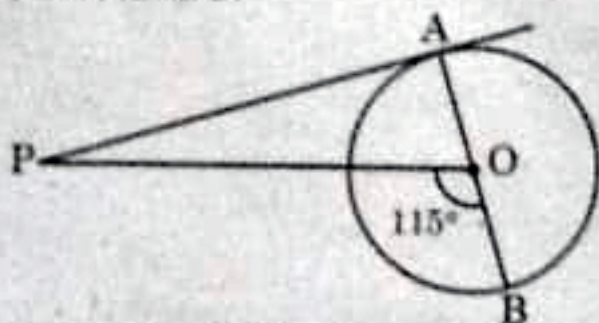

Fig. 4.

Section – C

Q. Nos. 27 to 34 carry 3 marks each.

27. 500 persons are taking dip into a cuboidal pond which is 80 m long and 50 m broad. What is the rise of water level in the pond, if the average displacement of the water by a person is 0.04 m³ ?

28. If $\sin \theta + \cos \theta = p$ and $\sec \theta + \csc \theta = q$, show that $q (p^2 - 1) = 2p$.

29. Prove that, a tangent to a circle is perpendicular to the radius through the point of contact.

OR

Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre.

30. On dividing $x^3 - 3x^2 + x + 2$ by a polynomial $g(x)$, the quotient and remainder were $x - 2$ and $-2x + 4$ respectively. Find $g(x)$.

OR

If the sum of the squares of zeros of the quadratic polynomial

$f(x) = x^2 - 8x + k$ is 40, find the value of k.

31. Find a, b and c if it is given that the numbers a, 7, b, 23, c are in AP.

OR

If m times the mth term of an AP is equal to n times its nth term, show that the $(m + n)^{th}$ term of the AP is zero.

32. Solve for x :

$$\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30} : x \neq -4, 7.$$

33. Show that the points A $(-1, 1)$, B $(5, 7)$ and C $(8, 10)$ are collinear.

34. If the areas of two similar triangles are equal, then prove that the triangles are congruent.

Section – D

Q. Nos. 35 to 40 carry 4 marks each.

35. If the angle of elevation of a cloud from a point 10 metres above a lake is 30° and the angle of depression of its reflection in the lake is 60°, find the height of the cloud from the surface of lake.

OR

A vertical tower of height 20 m stands on a horizontal plane and is surmounted by a vertical flag – staff of height h. At a point on the plane, the angle of elevation of the bottom and top of the flag staff are 45° and 60° respectively. Find the value of h.

36. In an equilateral triangle ABC, D is a point on the side BC such that $BD = \frac{1}{3} BC$. Prove that $9 AD^2 = 7 AB^2$.

OR

Prove that the sum of squares of the sides of a rhombus is equal to the sum of the squares of its diagonals.

37. Show that $(12)^n$ cannot end with digit 0 or 5 for any natural number n.

OR

Prove that $(\sqrt{2} + \sqrt{5})$ is irrational.

38. For the following frequency distribution, draw a cumulative frequency curve of 'more than' type and hence obtain the median value.

Classes	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	5	15	20	23	17	11	9

39. A fraction becomes $\frac{1}{3}$ when 1 is subtracted from the numerator and it becomes $\frac{1}{4}$ when 8 is added to its denominator. Find the fraction.

0. From a solid cylinder whose height is 2.4 cm and diameter 1.4 cm, a conical cavity of same height and same diameter is hollowed out. Find the total surface area of the remaining solid. $\left[\text{Use } \pi = \frac{22}{7} \right]$