Question Paper -3

Series : JBB/3

SET – 1

कोड नं.
Code No. **30/3/1**

रोल नं.
Roll No.

परीक्षार्थी कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें ।
Candidates must write the Code on the title page of the answer-book.

नोट	NOTE
(I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **15** हैं ।	(I) Please check that this question paper contains **15** printed pages.
(II) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें ।	(II) Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
(III) कृपया जाँच कर लें कि इस प्रश्न-पत्र में **40** प्रश्न हैं ।	(III) Please check that this question paper contains **40** questions.
(IV) **कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, प्रश्न का क्रमांक अवश्य लिखें ।**	(IV) **Please write down the Serial Number of the question in the answer-book before attempting it.**
(V) इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है । प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा । 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका में कोई उत्तर नहीं लिखेंगे ।	(V) 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

गणित (मानक)

MATHEMATICS (STANDARD)

निर्धारित समय : 3 घण्टे | *अधिकतम अंक : 80*

Time allowed : 3 hours | *Maximum Marks : 80*

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. The HCF of 135 and 225 is

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

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

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

3. The common difference of an AP, whose n^{th} term is $a_n = (3n + 7)$, is
   (a) 3 (b) 7 (c) 10 (d) 6

4. The value of λ for which $(x^2 + 4x + \lambda)$ is a perfect square, is
   (a) 16 (b) 9 (c) 1 (d) 4

5. 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

6. 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

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

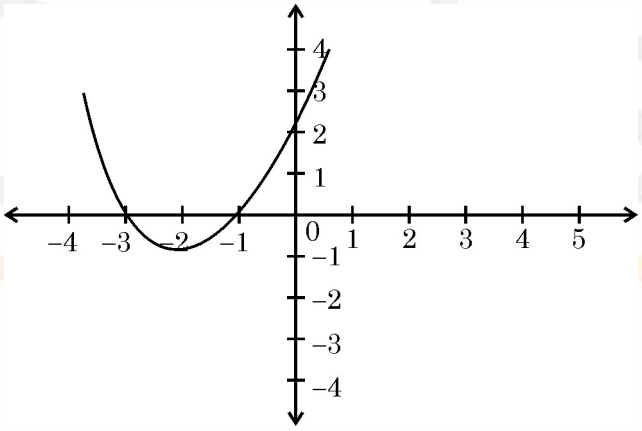

Fig. 1

   (a) 1 (b) 2 (c) 3 (d) 0

8. 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

9. 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

10. If Δ ABC ~ Δ DEF such that AB = 1.2 cm and DE = 1.4 cm, the ratio of the areas of Δ ABC and Δ DEF is
    (a) 49 : 36 (b) 6 : 7 (c) 7 : 6 (d) 36 : 49

In Q. Nos. **11** to **15,** fill in the blanks. Each question is of **1** mark :

11. $\sqrt{2}$ times the distance between (0, 5) and (–5, 0) is _____.

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

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

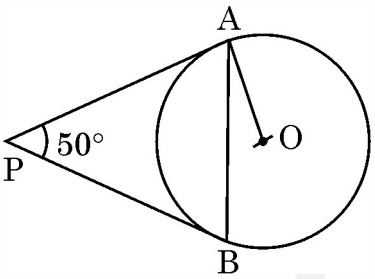

Fig. 2

OR

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

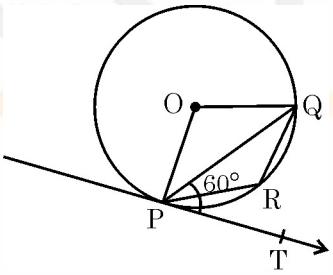

Fig. 3

14. $\frac{3 \cot 40^\circ}{\tan 50^\circ} - \frac{1}{2}\left(\frac{\cos 35°}{\sin 55°}\right) =$ _____.

15. If $\cot \theta = \frac{7}{8}$, then the value of $\frac{(1 + \sin \theta)(1 - \sin \theta)}{(1 + \cos \theta)(1 - \cos \theta)} =$ _____.

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

16. What is the value of $\left(\frac{1}{1 + \cot^2 \theta} + \frac{1}{1 + \tan^2 \theta}\right)$?

17. 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 ?

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

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

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

Section – B

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

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

OR

Solve the equation :

$1 + 5 + 9 + 13 + \ldots + x = 1326$

22. In Fig. 4 AB is a chord of circle with centre O, AOC is diameter and AT is tangent at A. Prove that $\angle BAT = \angle ACB$.

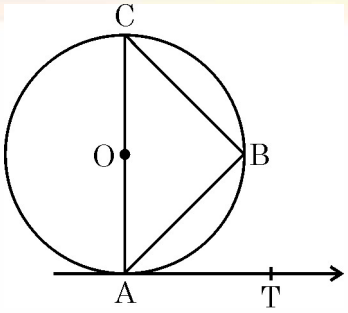

Fig. 4

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

OR

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

24. 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 cm^2 ?

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

25. Find the probability that a leap year selected at random will contain 53 Sundays and 53 Mondays.

26. 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 (fi)	6	8	15	p	8	4

Section – C

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

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

28. Find the values of k, for which the quadratic equation

$(k + 4) x^2 + (k + 1) x + 1 = 0$ has equal roots.

29. 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.

30. In what ratio does the point P(–4, y) divide the line segment joining the points A(–6, 10) and B(3, –8) if it lies on AB. Hence find the value of y.

31. 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.

32. In a right triangle, prove that the square of the hypotenuse is equal to the sum of squares of the other two sides.

33. If $\sin\theta + \cos\theta = p$ and $\sec\theta + \text{cosec}\,\theta = q$, show that $q(p^2 - 1) = 2p$.

34. 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 m^3 ?

Section – D

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

35. 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.

36. A train covered a certain distance at a uniform speed. If the train would have been 6 km/hr. faster, it would have taken 4 hours less than the scheduled time and if the train were slower by 6 km/hr., it would have taken 6 hrs. more than the scheduled time. Find the length of the journey.

37. 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.

38. 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.

39. A solid iron cuboidal block of dimensions 4.4 m × 2.6 m × 1 m is cast into a hollow cylindrical pipe of internal radius 30 cm and thickness 5 cm. Find the length of the pipe.

40. 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