2025

MATHEMATICS - B

Total marks : 80 Time : 3 hours

General Instructions:

i) Approximately 15 minutes is allotted to read the question paper and revise the answers.
ii) The question paper consists of 23 questions.
iii) All questions are compulsory.
iv) Internal choice has been provided in some questions.
v) Marks allocated to each question are indicated against it.

N.B: Check to ensure that all pages of the question paper are complete as indicated on the top left side.

Section – A

1. **Choose the correct answer from the given alternatives.**

(a) The degree of the polynomial $5x^4 + 4x^3 + 3x^2 + 2$ is **1**

(i) 5 (ii) 4 (iii) 3 (iv) 2

(b) A pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is said to be inconsistent if **1**

(i) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ (ii) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

(iii) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (iv) $\frac{a_1}{a_2} \neq \frac{c_1}{c_2}$

(c) The roots of the equation $3x^2 - 2\sqrt{6}x + 2 = 0$ are **1**

(i) $-\sqrt{\frac{2}{3}}, -\sqrt{\frac{2}{3}}$ (ii) $\sqrt{\frac{2}{3}}, \sqrt{\frac{2}{3}}$ (iii) $\sqrt{2}, \sqrt{2}$ (iv) $-\sqrt{2}, -\sqrt{2}$

(d) In the given A.P., –5, –1, 3, 7, ... the common difference is **1**

(i) –4 (ii) 0 (iii) 4 (iv) 8

(e) If $\tan\theta = 1$, then the value of θ is **1**

(i) 0° (ii) 30° (iii) 45° (iv) 90°

(f) The distance of the point P(2, 3) from the x-axis is **1**

(i) 1 (ii) 2 (iii) 3 (iv) 5

(g) Which of the following are not similar figures? **1**

(i) Circles (ii) Squares

(iii) Equilateral triangles (iv) Isosceles triangles

(h) A tangent intersects the circle at **1**
(i) one point. (ii) two distinct points.
(iii) at the circle. (iv) none of these.

(i) From a point Q, the length of the tangent to a circle is 8 cm and the distance of Q from the centre is 10 cm. The radius of the circles is **1**
(i) 5 cm (ii) 6 cm (iii) 9 cm (iv) 12 cm

(j) What will be the area of a sector of a circle with radius 6 cm, if the angle of the sector is 60° **1**
(i) $\frac{122}{7}$ (ii) $\frac{132}{7}$ (iii) $\frac{142}{7}$ (iv) $\frac{152}{7}$

(k) The perimeter of quadrant of a circle whose radius is $\frac{7}{2}$ cm is **1**
(i) 3.5 cm (ii) 5.5 cm (iii) 7.5 cm (iv) 12.5 cm

(l) If r is the radius of the sphere, then the surface area of the sphere is **1**
(i) $4\pi r^2$ (ii) $2\pi r^2$ (iii) πr^2 (iv) $\frac{4}{3}\pi r^2$

(m) The volume of a cone whose radius is 7 cm and height 12 cm is **1**
(i) 524 cm^3 (ii) 585cm^3 (iii) 604 cm^3 (iv) 616 cm^3

(n) The class mark of the interval 35-45 is **1**
(i) 10 (ii) 35 (iii) 40 (iv) 45

(o) A bag contains 4 red and 6 black balls. A ball is taken out of the bag at random. The probability of getting a black ball is **1**
(i) $\frac{1}{6}$ (ii) $\frac{2}{5}$ (iii) $\frac{3}{5}$ (iv) 1

Section – B

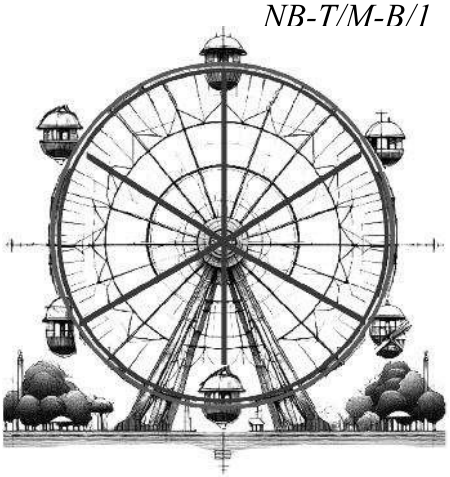
2. Find the LCM and HCF of 12, 15 and 21 by prime factorisation method. **2**

3. For what value of k does the quadratic equation $2x^2 + kx + 3 = 0$ have two equal roots? **2**

4. Evaluate: sin 60° cos 30° + sin 30° cos 60° **2**

5. Find the distance between the points (2, 3) and (4, 1) **2**

6. E and F are points on the sides PQ and PR respectively of a ΔPQR. If PE = 4cm, QE = 4.5 cm, PF = 8 cm and RF = 9 cm then show that EF || QR. **2**



7. The diameter of a ferris wheel is 50 meters. The ferris wheel's circular section is divided into equal sectors, with a central angle of 60°. Calculate the area of each sector of the circular part. [Use $\pi = \frac{2}{7}$] **2**

8. If P(E) = 0.05, what is the probability of 'not E'? **2**

Section – C

9. Find the zeroes of the quadratic polynomial $x^2 - 2x - 8$ and verify the relationship between the zeroes and the coefficients. **3**

10.(**a**) Solve the pair of linear equations by elimination method:
$x + y = 14$ and $x - y = 4$
Or **3**

(b) Find the roots of the quadratic equation $100x^2 - 20x + 1 = 0$ by factorization method.

11. (**a**) The 17^{th} term of an A.P. excels its 10^{th} terms by 7. Find the common difference.
Or **3**

(b) Find the sum of the first 15 multiples of 8.

12. In ΔABC right-angled at B, if $\tan A = \frac{1}{\sqrt{3}}$, find the value of
sin A cos C + cos A sin C **3**

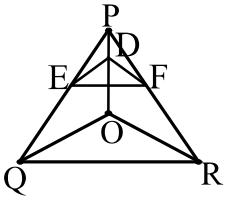
13. Prove that: $(\text{cosec } A - \sin A)(\sec A - \cos A) = \frac{1}{\tan A + \cot A}$, where angle A is acute. **3**

14. **a.** A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree.
Or **3**

b. The angle of elevation of the top of a tower from a point on the ground which is 30 m away from the foot of the tower is 30°. Find the height of the tower.

15. Find the coordinates of a point A where AB is the diameter of a circle whose centre is (2, –3) and B is (1, 4). **3**

16. In the adjoining figure, if DE || OQ and DF || OR, show that EF || QR. **3**

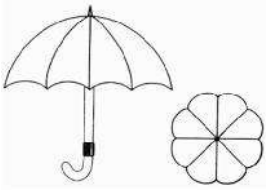


17. **a.** Prove that the lengths of tangents drawn from an external point to a circle are equal.

Or **3**

b. Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.

18. An umbrella has 8 ribs which are equally spaced. Assuming umbrella to be a flat circle of radius 45 cm, find the area between the two consecutive ribs of the umbrella. **3**



19. **a.** A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy. (Use $\pi = \frac{2}{7}$)

Or **3**

b. A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid in terms of π. (Use $\pi = \frac{2}{7}$)

20. This summer, Ketho made the decision to read a few books. To get a book, he visits the library. 25 books are stacked on a shelf. There are 7 Biographies, 8 Fantasy Novels and 10 Science Fiction books. What is the probability that:
(i) he choose a Biography book? (ii) he choose a Science Fiction book?
(iii) he choose both fictional books on Fantasy and Science? **3**

Section – D

21. **Answer any one from the following questions (a) to (c):** **5**

a. Draw the graphs of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Determine the coordinate of the vertices of the triangle formed by these lines and the x-axis and shade the triangular region.

Or

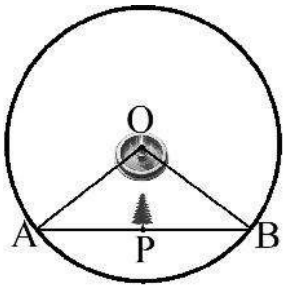
b. A fraction becomes $\frac{9}{1}$ if 2 is added to both the numerator and the denominator. If 3 is added to both the numerator and the denominator, it becomes $\frac{5}{6}$. Find the fraction.

Or

c. Is it possible to construct a rectangular mango groove whose length is twice its breadth and the area is 800 m^2? Using discriminant, check whether the above situation is possible or not. If possible, find its length and breadth using the quadratic formula.

22. **Answer any one from the following questions (a) to (c):** **5**

a. Tia is standing at a water-fountain which is located at the center of a 50-meter-radius circular park. He sees his two buddies, Avika and Bobby, standing at locations A and B respectively, on the park's edge. A pine tree is located perpendicular to the centre O at position P, creating two triangles ΔOAP and ΔOBP.

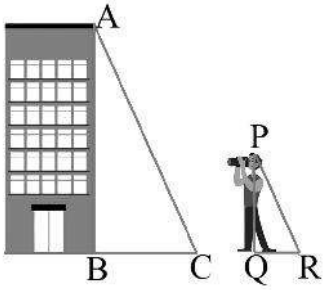


(i) Prove that ΔOAP ~ΔOBP.

(ii) If the pine tree is 30 m away from Bobby, what is the distance between Avika and Bobby?

Or

b. Rawat is a photographer who wants to capture a picture of a building's height. At a particular instance, the length of the building's shadow and the length of Rawat's shadow are 24 m and 4 m respectively. Using the given information:

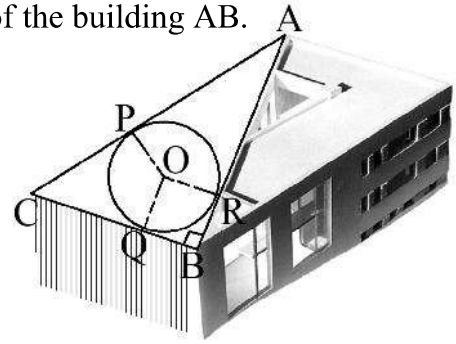


(i) Prove that ΔABC ~ ΔPQR

(ii) If Rawat is PQ = 1.6 m tall, find the height of the building AB.

Or

c. A courtyard is in the shape of a triangle with right angle at B, BC = 6 cm and AB = 8 cm. Within the courtyard, a pit was excavated so that it touches the walls AC, BC and AB at P, Q and R respectively. Find the radius of the pit.



23. **Answer any one from the following questions (a) to (c):** **5**

a. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is ₹18. Find the missing frequency *f*.

Daily pocket allowance (in ₹)	11-13	13-15	15-17	17-19	19-21	21-23	23-25
No. of children	7	6	9	13	*f*	5	4

Or

b. A student noted the number of cars passing through a spot on a road for 100 periods each of 3 minutes and summarized it in the table given below. Find the mode of the data:

No. of cars	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	7	14	13	12	20	11	15	8

Or

c. The following table gives the distribution of the life time of 400 neon lamps:

Life time (in hours)	1500-2000	2000-2500	2500-3000	3000-3500	3500-4000	4000-4500	4500-5000
No. of lamps	14	56	60	86	74	62	48

Find the median life of a lamp.

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