

01 Set

HIGHER MATHEMATICS (CREATIVE)
[According to the Syllabus of 2025]

Subject Code :

1	2	6
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Time—2 hours and 35 minutes
Full marks—50

[N.B. The figures in the right margin indicate full marks. Answer total five questions taking at least one from each group.]

Group A—Algebra

Marks

1. (i) $\frac{a^2 - bc}{p} = \frac{b^2 - ca}{q} = \frac{c^2 - ab}{r} \neq 0$

(ii) $Q(y) = \frac{y^2}{y^2 - 49}$

(a) Determine the domain of $f(x) = \sqrt{2x - 5}$. 2

(b) Show that, $(a + b + c)(p + q + r) = (pa + qb + rc)$. 4

(c) Express $Q(y)$ as partial fraction. 4

(i) $1 + (1 + y)^{-1} + (1 + y)^{-2} + (1 + y)^{-3} + \dots$ is an infinite geometric series.

(ii) In the expansion of $\left(x + \frac{k}{x}\right)^7$, the coefficient of k^5 is 567.

(a) If $y = 2$, then determine the common ratio of the series. 2

(b) Find the value of x . 4

(c) What conditions should be imposed upon y so that the series has sum up to infinity and find that sum. 4

3. (i) $N = \frac{\log_k(7 + x)}{\log_k x}$

(ii) $p^2 + 2 = 3^{\frac{2}{3}} + 3^{\frac{-2}{3}}$ and $p \geq 0$.

(a) Find the discriminant of the equation $2x^2 - x + 1 = 0$. 2

(b) Prove that, $3p^3 + 9p = 8$. 4

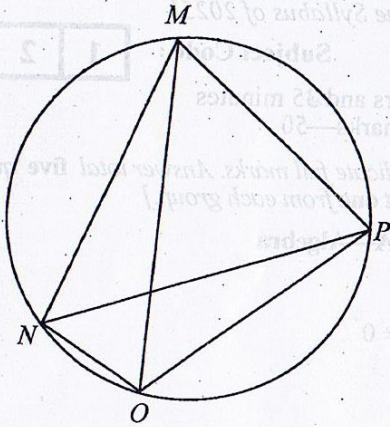
(c) If $N = 2$, then show that $x = \frac{1 + \sqrt{29}}{2}$. 4



Group B—Geometry and Vector

Marks

4.



- (a) Draw such a circle which passes through two definite points and whose centre lies on a definite straight line. [only sign of drawing of the figure is needed] 2
- (b) Prove that, $MO \cdot NP = MN \cdot OP + MP \cdot ON$. 4
- (c) If T is the middle point of NP , then prove that, $MN^2 + MP^2 = 2(MT^2 + NT^2)$. 4

5. The co-ordinates of the four points are respectively $P(1, 2)$, $Q(-2, 1)$, $R(0, -3)$ and $S(3, -2)$.

- (a) Find the equation of the straight line with slope 3 and passes through the point $N(1, 2)$. 2
- (b) Find the area of the quadrilateral $PQRS$. 4
- (c) Find the co-ordinate of the intersecting point of two lines PR and QS . 4

6. (i) The height of a right circular cone is 12 cm and its volume is 100π cubic cm.

- (ii) A, B, C and D are the middle points of the sides PQ, QR, RS and PS respectively of the quadrilateral $PQRS$.

- (a) Find the volume of a sphere of radius 3 cm. 2
- (b) Determine the slant height of the right circular cone. 4
- (c) Prove with help of vectors that $ABCD$ is a parallelogram. 4

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Group C—Trigonometry and Probability

Marks

7. $m = \tan\theta$, $n = \sec\theta$ and $q = \frac{\cos\theta}{1 - \sin\theta}$.

- (a) Express $85^\circ 15'$ in radians. 2
- (b) Prove that $\frac{m+n-1}{m-n+1} = q$. 4
- (c) If $m^2 + n^2 = \frac{5}{3}$ and $0 < \theta < 2\pi$, then find the value of θ . 4

8. An unbiased dice and two unbiased coins are thrown and tossed once.

- (a) What is the probability of getting a number divisible by 2 in a single throw of a dice. 2
- (b) Draw the probability tree and write down the sample space. 4
- (c) Find the probabilities of (i) getting at least one T and (ii) getting prime number on dice and same event on coins. 4

