# MODAL QUESTIONS
OF

U.G. Sem - V PAPER DSEMATH SOIA (ii)

For B.A./B.Sc. Programme

PREPARED
BY

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Time : 3 Hours

Full Marks : 70

Candidates are required to give their answers in their own words as far as possible.

The figures in the margin indicate full marks.

## PART-A

Q.No.1. Answer all questions $2 \times 10 = 20$

(a) If the origin (0,0) be shifted to a new point (h, k), and axes remain parallel to the original. Then transformation is called

(i) Rotation (ii) Translation

(iii) Translation and rotation both (iv) None of these.

(b) latus rectum of parabola $y^2 = 4ax$ is

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

(c) The equation of tangent at (2, 3) point of the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is

(i) $\frac{x}{2} + \frac{y}{3} = 1$ (ii) $\frac{x}{3} + \frac{y}{2} = 1$ (iii) $\frac{2x}{9} + \frac{3y}{4} = 1$

(iv) $\frac{3x}{4} + \frac{2y}{9} = 1$

(d) what conic is represented by the equation of second degree $x^2 + y^2 + 2x + 3y + 4 = 0$,

(i) Ellipse (ii) Parabola (iii) hyperbola (iv) None of these

(e) The equation of the director circle of the conic $\frac{l}{r} = 1 + e\cos\theta$ is

(i) $(1-e^2)r^2 + 2elr\cos\theta - 2l^2 = 0$

(ii) $(1+e^2)r^2 + 2elr\cos\theta - 2l^2 = 0$

(iii) $(1-e^2)r^2 - 2elr\cos\theta + 2l^2 = 0$

(iv) $(1-e^2)r^2 + 2elr\cos\theta + 2l^2 = 0$

(f) A binary relation in a set X is said to be a "partial order relation" if it is

(i) reflexive, symmetric and transitive

(ii) Symmetric, Antisymmetric and reflexive

(iii) reflexive, antisymmetric and transitive

(iv) [illegible] None of these.

(g) For any cardinal number $\alpha, \beta, \gamma$, which is not true

(i) $(\alpha+\beta)+\gamma = \alpha+(\beta+\gamma)$

(ii) $(\alpha\beta)\gamma = \alpha(\beta\gamma)$

(iii) $\alpha+\beta = \beta+\alpha$

(iv) $2.\alpha = \alpha$

(h) A subset of a denumerable set is either

(i) infinite or denumerable

(ii) finite or denumerable

(iii) infinite or non denumerable

(iv) finite or non denumerable.

(i) If $f: X \to Y$ and $A, B \subseteq X$, then $f(A \cap B) = f(A) \cap f(B)$, if

(i) f is Many-one

(ii) f is into

(iii) f is onto

(iv) f is one-one

(j) If A be a non empty set and R is an equivalence relation in A and let $a, b \in A$. Then

(i) either $[a] = [b]$ or $[a] \cap [b] = \phi$

(ii) either $[a] = [b]$ or $[a] \cap [b] \neq \phi$

(iii) either $[a] \neq [b]$ or $[a] \cap [b] = \phi$

(iv) either $[a] \neq [b]$ or $[a] \cap [b] \neq \phi$.

## PART – B

Answer any four questions of the following: $5 \times 4 = 20$

Q. No. 2. What does the equation $(a-b)(x^2+y^2) - 2abx = 0$, become if the origin be moved to the point $\left(\frac{ab}{a-b}, 0\right)$, the direction of the axes remaining unchanged?

Q No. 3. Show that, there are three normals can be drawn from an external point to a parabola.

Q. No. 4. Find the equation of the tangent to the hyperbola $4x^2 - 9y^2 = 1$, which is parallel to the line $4y = 5x + 7$.

Q. No. 5. Find the co-ordinates of the centre of the conic $x^2 - 4xy - 2y^2 + 10x + 4y = 0$, and hence find the equation of the conic referred to the centre as origin.

Q. No. 6. In any conic $\frac{l}{r} = 1 + e\cos\theta$, prove that the sum of the reciprocals of two perpendicular focal chords is constant.

Q. No. 7. State and prove general De-Morgan's theorem.

Q. No. 8. Prove that, the equality relation in a set X is the only relation which is an equivalence relation as well as a partial order relation.

Q. No. 9. Prove that the set Q of all rational numbers is denumerable.

## PART – C

Answer any two questions: $15 \times 2 = 30$

Q. No. 10. Prove that every cartesian equation of the second degree represents a conic. Also write the conditions for representing an ellipse, a parabola and a hyperbola.

Q. No. 11 (a) Find the polar equation of a conic whose latus rectum is $2l$ and eccentricity $e$, the focus being the pole.

(b) A conic is described having same focus and eccentricity as the conic $\frac{l}{r} = 1 + e\cos\theta$ and the two conics touch at the point $\theta = \alpha$. Prove that the length of its latus rectum is $\frac{2l(1-e^2)}{e^2 + 2e\cos\alpha + 1}$.

Q. No. 12 If $f: X \to Y$ and $A, B \subseteq X$, then Prove that

(i) $A \subseteq B \Rightarrow f(A) \subseteq f(B)$

(ii) $f(A \cup B) = f(A) \cup f(B)$

(iii) $f(A \cap B) \subseteq f(A) \cap f(B)$

(iv) $f(A \cap B) = f(A) \cap f(B)$, if $f$ is one-one.

Q. No. 13. For every non-empty set $X$, Prove that $X \prec P(X)$, where $P(X)$ is the set of all sub-sets of $X$.

—— X ——

Answers of objectives of Q. No. 1

a —— (ii)
b —— (iv)
c —— (iii)
d —— (i)
e —— (i)
f —— (iii)
g —— (iv)
h —— (ii)
i —— (iv)
J —— (i)

Siddiqui
K.C.C.