



K17U 0815

Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree (CBCSS – Reg./Supple./Imp.)

Examination, May 2017

(2014 Admn. Onwards)

CORE COURSE IN MATHEMATICS

4B04 MAT : Elements of Mathematics – II

Time : 3 Hours

Max. Marks : 48

SECTION – A

All the 4 questions are **compulsory**. Each question carries 1 mark.

1. Find the number of relations from  $A = \{a, b, c\}$  to  $B = \{1, 2\}$ .
2. Define partially ordered set.

3. Find the rank of the matrix  $\begin{bmatrix} 3 & 1 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$ .

4. When a square matrix is said to be non-singular ? (4×1=4)

SECTION – B

Answer **any 8** questions. Each question carries 2 marks.

5. Find  $R^{-1}$  if  $R = \{(1, 4), (1, 3), (3, 2)\}$ .
6. Define a recursive function to obtain the successive terms of the Fibonacci series.
7. Suppose that  $R$  is a partial order on  $A$ . Show that  $R^{-1}$  is also a partial order on  $A$ .

P.T.O.



8. Show that every finite lattice  $L$  is bounded.
9. Define supremum and infimum in a partially ordered set.
10. Find the coordinates of the point in which the line  $x + y = 6$  is normal to the parabola  $y^2 = 8x$ .
11. Show that the tangent at the vertex of the parabola is perpendicular to the axis.
12. Find the equation of a tangent passing through  $(2, 8)$  to the hyperbola  $5x^2 - y^2 = 5$ .
13. Reduce to normal form, the matrix  $\begin{bmatrix} 2 & 2 & 2 \\ 1 & 2 & 1 \\ 3 & 4 & 3 \end{bmatrix}$ .
14. Is rank of  $AB = \text{rank of } A \times \text{rank of } B$ , where  $A$  and  $B$  are matrices? Justify.

(8×2=16)

## SECTION - C

Answer **any 4** questions. **Each** question carries **4** marks.

15. Find the inverse of the function  $f(x) = \frac{2x - 3}{5x - 7}$ .
16. Let  $R$  be the relation on the set of positive integers defined by  $x \approx y$  if  $x + 3y = 12$ . Then write  $R$  as set of ordered pairs. Also find domain of  $R$ .
17. Let  $L$  be a bounded distributive lattice, then prove that complements are unique if they exist.
18. Find the equation of the tangent to the hyperbola  $3x^2 - y^2 = 3$ , parallel to the line  $y = 2x + 4$ .
19. Find the equation of a tangent common to both the parabola  $y^2 = 8x$  and the ellipse  $\frac{x^2}{4} + \frac{y^2}{15} = 1$ .
20. Find the rank of the following matrix by reducing to row reduced echelon form

$$\begin{bmatrix} 1 & 2 & 3 & 1 \\ 2 & 4 & 6 & 2 \\ 1 & 2 & 3 & 2 \end{bmatrix}$$

(4×4=16)



## SECTION – D

Answer **any 2** questions. **Each** question carries **6** marks.

21. Let  $f : A \rightarrow B$ ,  $g : B \rightarrow C$  be two functions prove :

- a)  $g \circ f$  is one to one then  $f$  is one to one.
- b)  $g \circ f$  is onto then  $g$  is onto.

22. Let  $L$  be complemented lattice with unique complements. Then prove that the join of irreducible elements of  $L$ , other than  $0$  are its atoms.

23. Find the locus of the point of intersection of perpendicular tangents to the hyperbola

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1.$$

24. Using elementary transformation, compute the inverse of the matrix

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 2 \end{bmatrix}$$

(2×6=12)

---