K18U 0934

Reg. No. : ....

Name : ....

IV Semester B.Sc. Degree (CBCSS – Reg./Supple./Imp.) Examination, May 2018
(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** carries **1** mark.

1. Define reflexive relation.

2. Draw an example of a distributive lattice.

3. Find the rank of a square matrix in which every element is 1.

4. Is the matrix $\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$ singular or non singular ? (4×1=4)

SECTION – B

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

5. If f : R → R, g : R → R be defined as $f(x) = x^2$, $g(x) = x + 4$, find g ∘ f.

6. Define a recursive function to obtain the successive terms of the Fibonacci series.

7. Let A be the set of non zero integers and let ≈ be the relation on A × A defined as follows :
(a, b) ≈ (c, d) whenever ad = bc. Prove that ≈ is an equivalence relation.

8. Let A = {1, 2, 3, 4, 6, 8, 9, 12} be ordered by the relation "x divides y". Draw the Hasse diagram.

9. Define minimal and maximal in a partially ordered set.

P.T.O.

10. Find the co-ordinates of the point in which the line $x + y = 6$ is normal to the parabola $y^2 = 8x$.

11. Find the equation of the polar of (x_1, y_1) with respect to the parabola $y^2 = 4ax$.

12. Reduce to normal form, the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$.

13. Find the rank of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$.

14. Find an equation of a common tangent to the parabola $y^2 = 8x$ and the hyperbola $3x^2 - y^2 = 8$.

(8×2=16)

SECTION – C

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

15. $f : R \to R$ defined by $f(x) = 3x - 7$. Find a formula for f^{-1}.

16. Give examples of relations R on A = {1, 2, 3} having
   a) R is both symmetric and anti symmetric
   b) R is neither symmetric nor anti symmetric.

17. Let L be a bounded distributive lattice, then prove that complements are unique if they exist.

18. Obtain the equation of the asymptotes to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.

19. If the normal at the end of the latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ passes through an end of the minor axis, then prove that $e^4 + e^2 = 1$.

20. Find the rank of the following matrix by reducing to the row reduced echelon form

$$\begin{bmatrix} 1 & 1 & -1 & 1 \\ 1 & -1 & 2 & -1 \\ 3 & 1 & 0 & 1 \end{bmatrix}.$$

(4×4=16)

SECTION – D

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

21. a) Find R^{-1} if $R = \{(1, 4), (1, 3), (3, 2)\}$

    b) Find the inverse of $f(x) = \frac{2x-3}{5x-7}$.

22. a) Suppose that R is a partial order on a set A, then show that R^{-1} is also a partial order on A.

    b) Show that every finite lattice L is bounded.

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

    $$\begin{bmatrix} 1 & 1 & 1 & 1 \\ -2 & 1 & -1 & -2 \\ -4 & -2 & -3 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}.$$

(2×6=12)
