This question paper contains 5 printed pages]

# AF—14—2022

## FACULTY OF COMPUTER SCIENCE

## B.Sc. (Second Year) (Third Semester) EXAMINATION

## NOVEMBER/DECEMBER, 2022

## (CBCS REVISED)

## COMPUTER SCIENCE

Paper-304

(Mathematical Technique in Computer Science)

**(Friday, 16-12-2022)** **Time : 2.00 p.m. to 5.00 p.m.**

*Time—Three Hours* *Maximum Marks—75*

*N.B.* :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data if required.

(*iv*) Any electronic device is not allowed.

1. Attempt any *five* of the following (3 marks each) : 15

(*a*) Define isomorphism of graph with any *two* types.

(*b*) Define probability with its examples.

(*c*) Explain degree of vertices with its examples.

(*d*) Define matrix with its any *three* types.

(*e*) How many natural numbers between 17 and 80 are divisible by 6 ?

(*f*) Explain relation with examples.

P.T.O.



(*g*) Define :

(*i*) Complement of Set

(*ii*) Null Set

(*iii*) Equivalent of Set.

2. Attempt any *three* of the following : 15

(*a*) If $A = \begin{bmatrix} 2 & 4 & 3 \\ 6 & 5 & 1 \\ 1 & 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} -3 & 2 & 1 \\ -1 & 4 & 5 \\ 6 & 0 & 2 \end{bmatrix}$

find A + B, A − B, A·B.

(*b*) Find the HCF and LCM of the following :

(*i*) $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27}$

(*ii*) 0.63, 1.05, 2.1.

(*c*) If A = {1, 2, 3, 4}, B = {3, 4, 5, 6}, C = {5, 6, 7, 8}, D = {7, 8, 9, 10}, find A ∪ B, A ∪ B ∪ C, B ∪ C ∪ D and also explain with its Venn diagram.

(*d*) Let R be a relation on Q defined by R = {(*a*, *b*)/*a*, *b* ∈ Q and *a* − *b* ∈ Z}. Show that R is an equivalence relation.

(*e*) Define graph and explain its any *five* types.

3. Attempt any *three* of the following (5 marks each) : 15

(*a*) Two dice are thrown together. What is the probability that the sum of the numbers on the two faces is divisible by 4 or 6 ?

(b) Find the inverse of matrix by the elementary transformation :

$$A = \begin{bmatrix} 1 & -2 & 2 \\ 2 & -3 & 6 \\ 1 & 1 & 7 \end{bmatrix}$$

(c) Aman travelled from the village to the post-office at the rate of 25 kmph and walked back at the rate of 4 kmph. If the whole journey took 5 hours 48 minutes, find the distance of post-office from the village.

(d) Write short notes on Set operations.

(e) Find the inverse of matrix by the adjoint method :

$$B = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & 1 \\ 1 & -1 & 2 \end{bmatrix}$$

4. Attempt any *three* of the following (5 marks each) : 15

(a) In a class of 200 students who appeared certain examination 35 students failed in CET, 40 in NEET and 40 in JEE, 20 failed in CET and NEET, 17 in NEET and JEE and 5 failed in all three examinations. Find how many students :

(i) Did not fail in any examinations

(ii) Failed in NEET or JEE entrance.

P.T.O.



(b) Let A = {1, 2, 3, 4}, B = {4, 5, 6}, C = {5, 6} verify that :

(i) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

(ii) $A \times (B \cup C) = (A \times B) \cup (A \times C)$

(c) Define :

(i) Null graph

(ii) Multi graph

(iii) Regular graph

(iv) Euler graph

(v) Hamiltonian graph.

(d) A can do a piece of work in 7 days of 9 hours each and B can do it in 6 days of 7 hours each. How long will they take to do it working together $8\frac{2}{5}$ hours a day ?

(e) Write a note on work, path and circuit.

5. Attempt any *three* of the following : 15

(a) Define domain, range and co-domain and also show that R = {(1, 2) (1, 4) (3, 2) (3, 4)} is a relation from A to B, where A = {1, 2, 3}, B = {2, 4, 8} using arrow diagram.

(b) Find the adjoint of matrix :

(i) $A = \begin{bmatrix} 3 & 5 & 7 \\ 2 & -3 & 1 \\ 1 & 1 & 2 \end{bmatrix}$

(ii) $B = \begin{bmatrix} 1 & -5 \\ 4 & 9 \end{bmatrix}$

(c) Find employees in a company of 20 are graduates. If 3 are selected out of 20 at random. What is the probability that :

(i) They are all graduates

(ii) There is at least one graduate among them ?

(d) A and B working separately can do a piece of work in 9 and 12 days respectively. If they work for a day alternatively A beginning in how many days the work will be completed.

(e) Explain the properties of relation.