

SH-II/Comp. Sc./202/C-4/19

B.Sc. 2nd Semester (Honours) Examination, 2019**COMPUTER SCIENCE****(Discrete Structures)****Paper : 202/C-4****Course ID : 21512****Time: 2 Hours****Full Marks: 40***The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.***1. Answer any five questions:**

2×5=10

- (a) Define partial order relation.
- (b) Find the number of ways to paint 12 balls so that 3 of them will be green, 2 of them pink, 2 of them yellow and remaining ones are white.
- (c) When an argument is said to be valid and when it is called fallacy?
- (d) What is a directed multigraph? Give example.
- (e) Define planar graph.
- (f) What is recurrence tree?
- (g) Define with example the concept of a numeric function.
- (h) What is Pigeonhole principle?

2. Answer any four questions:

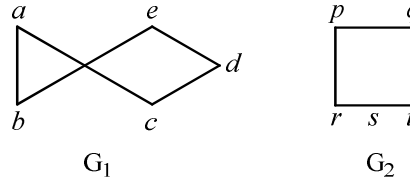
5×4=20

- (a) What is the principle of mathematic induction? Show that $1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$ ($n \geq 1$) by mathematical induction. 1+4=5
- (b) Let $A = \{1, 2, 3\}$. How many different binary relations on A are there? How many of them are reflexive and how many are symmetric? Define equivalence relation. 1+2+2=5
- (c) Write the recurrence relation for the Fibonacci sequence of numbers. Solve the recurrence relation $a_r = 7a_{r-1} - 10a_{r-2}$ given that $a_0 = 0$ and $a_1 = 3$. 1+4=5
- (d) When a proposition is called a contradiction? Determine the validity of following arguments:
 - (i) $p \rightarrow \neg q, r \rightarrow q, r \vdash \neg p$
 - (ii) $p \rightarrow q, \neg p \vdash \neg q$ 1+2+2=5
- (e) Write Prims algorithm for finding MST. Explain with suitable example. 5
- (f) Define the following with example:
 - (i) Adjacency Matrix of a graph
 - (ii) Rank and nullity of a graph 2+3=5

3. Answer *any one* of the following:

10×1=10

- (a) What is edge connectivity? Discuss isomorphism of graph in brief. Using adjacency matrices show that graphs G_1 and G_2 are isomorphic.



- (b) Among 100 students 32 study mathematics, 20 study physics, 45 study biology, 15 study mathematics and biology, 7 study mathematics and physics, 10 study physics and biology and 30 do not study any of three subjects.

- (i) Find the number of students studying all three subjects.
- (ii) Find number of students studying exactly one subject.
- (iii) Let p denote the statement “The weather is nice” and q denotes the statement “We have a picnic”. Translate the following in english:

$$p \wedge \bar{q}, p \leftrightarrow q, \bar{q} \rightarrow \bar{p}, \bar{p} \vee q$$

3+3+4=10
