CLASS: B.Tech.   SEMESTER : VII/ADD
BRANCH: ALL   SESSION : SP/2023

SUBJECT: MA205 DISCRETE MATHEMATICS
TIME: 3 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL

Q.1(a)   Prove that for any positive integer   [5]   1   3
$$n > 2; \frac{1}{\sqrt{1}} + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{4}} + \frac{1}{\sqrt{5}} + \frac{1}{\sqrt{6}} + \frac{1}{\sqrt{7}} + \cdots \frac{1}{\sqrt{n}} > \sqrt{n}$$

Q.1(b)   Check whether the given proposition is tautology, contradiction or contingency   [5]   1   3
$$\big((p \Rightarrow q) \Rightarrow r\big) \Leftrightarrow \big((p \Rightarrow r) \vee (q \Rightarrow r)\big).$$

Q.2(a)   Solve by generating function method $a_r = 6a_{r-1} - 9a_{r-2} + 3^{r+2}; a_0 = 3, a_1 = 9$ [5]   2   2

Q.2(b)   Solve $a_{r+2} - 5a_{r+1} + 6a_r = r^2$ with initial condition $a_0 = 1 \ and \ a_1 = -1$.   [5]   3   3

Q.3(a)   If R and S are equivalence relations on the set A, prove that $(i) R^{-1}$ is an equivalence   [5]   2   3
relation $(ii) \ R \cap S$ is an equivalence relation.

Q.3(b)   Define Hasse digram and draw the Hasse diagram for the Poset $(P(S), \subseteq)$ where $P(S)$ [5]   2   1,3
is the power set on $S = \{a, b, c\}$.

Q.4(a)   Find the order of $f, f^{-1}, g \ and \ (gof)^{-1}$ for the given $f = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 5 & 4 & 1 & 2 \end{pmatrix}$ and g=   [5]   4   5
$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 5 & 4 & 3 & 1 & 2 \end{pmatrix}$.

Q.4(b)   Let G be the set of all 2x2 matrices $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ where a,b,c,d are real numbers such that   [5]   3   2
$ad - bc = 1$. Is G is a group under matrix multiplication? Justify.

Q.5(a)   Define Isomorphic Graph, Euler & Hamilton graphs with example.   [5]   3   2
Q.5(b)   Using Kruskal's algorithm find a minimum spanning tree of the weighted graph given   [5]   3   5
below