BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

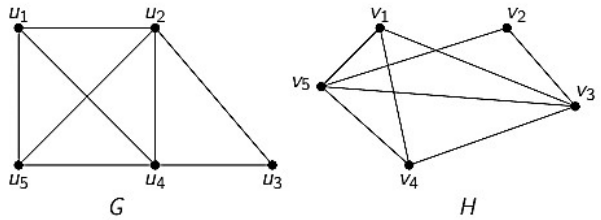
CLASS: IMSC **SEMESTER : IV**
BRANCH: MATHS **SESSION : SP/2025**

SUBJECT: MA210 DISCRETE MATHEMATICS & GRAPH THEORY

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)	By using truth table find whether following formula is tautology or not :- $(p \leftrightarrow (q \wedge r)) \rightarrow (\sim r \rightarrow \sim p)$	[5]	1	2
Q.1(b)	By method of mathematical induction prove/disprove that $\sum_{i=1}^{n}(5i-4) = \frac{n(5n-3)}{2}$	[5]		
Q.2(a)	Solve the recurrence relation by method of generating function $a_r - 2a_{r-1} + a_{r-2} = \frac{1}{4}2^r$; $r \geq 2$, $a_0 = 2$, $a_1 = 1$	[5]	2	2
Q.2(b)	Solve the recurrence relation $a_r - 4a_{r-1} + 4a_{r-2} = (r+1)2^r$	[5]	2	2
Q.3(a)	Time complexity of an algorithm is given below. Find asymptotic upper bound of the algorithm. $T(n) = \begin{cases} a, & for\ n=1, \\ 2T(\frac{n}{2}) + cn & for\ n>1. \end{cases}$ Where **a** and **c** are constants.	[5]	3	3
Q.3(b)	Find by principle of inclusion and exclusion how many positive integers less than 100 is not divisible by 2, 3 and 5?	[5]	3	2
Q.4(a)	Find whether graphs are isomorphic or not. If isomorphic then find correspondence between edge and vertices and in one matrix represent adjacency matrix of both graphs. If not isomorphic, then explain the reasons.	[5]	4	2



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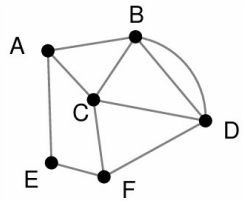
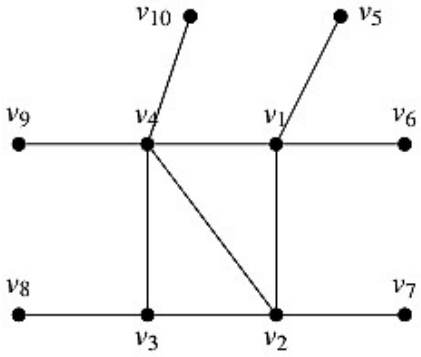
Q.4(b) If possible find Euler path and circuit of following graph. [5] 4 2



Q.5 For the following graph find (i) eccentricity of each vertices (ii) center, radius and diameter of graph (iii) Find all cut edges and cut vertices (iv) if possible find four spanning tree (v) find the matrix, by which possible number of spanning tree can be found. [10] 5 5



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