

2017 (D)

(This question paper contains 3 printed pages)

Roll No.

Sl. No of Question Paper: 5631

Unique Paper Code: 234103

Name of the Paper: Discrete Structures

Name of the Course: B. Sc. (Hons.) Computer Science

Semester: I

H

Time : 3 hrs

M.Marks:75

Section A is compulsory. Attempt any 4 questions from section B.

Please attempt parts of a question together.

Q 1 Determine the number of integers between 1 and 250 those are divisible by any of the integers 2, 3, 5 and 7.

Section A

- b) How many committees of five people can be chosen from 20 men and 12 women, if exactly three men must be on each committee?
- ii) if at least three women must be on each committee?
- c) For a given graph G, Prove that the sum of degrees of the vertices is always even.

d) Let a be a numeric function such that

$$a = \begin{cases} 2^{-r} + 5 & 0 \leq r \leq 3 \\ r \geq 4 \end{cases}$$

- e) Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent.

f) Suppose that a person deposits Rs. 10,000 in a saving account at a bank yielding 11% per year with interest compounded annually. How much will be in the account after 30 years?

g) Use master method to find the running time for the given $T(n) = 124 T(n/5) + n^3$.

Section B

Q.2(a) Let R be a relation on the set $A = \{4, 5, 6, 7\}$ defined by

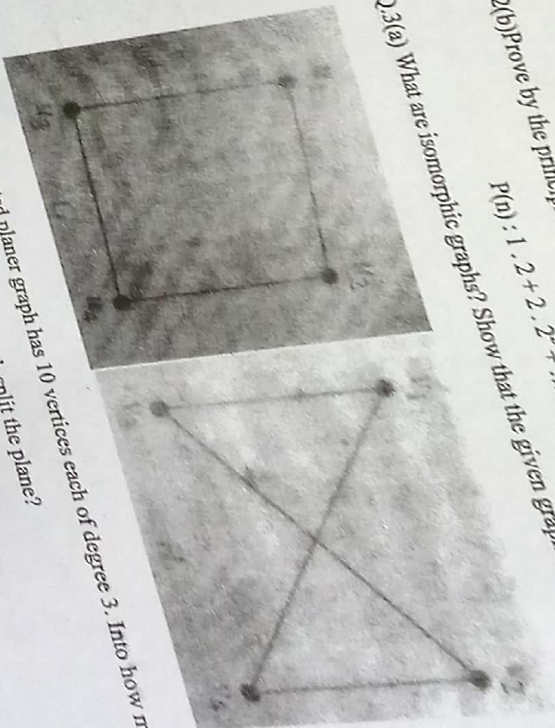
$$R = \{(4,5), (5,5), (5,6), (6,7), (7,4), (7,7)\}$$

Find the reflexive, transitive and symmetric closure of R

Q.2(b) Prove by the principle of mathematical induction that

$$P(n) : 1 \cdot 2 + 2 \cdot 2^2 + \dots + n \cdot 2^n = (n-1) 2^{n+1} + 2$$

Q.3(a) What are isomorphic graphs?



Q.3(b) A connected planar graph has 10 vertices each of degree 3. Into how many regions, does the representation of this planar graph split the plane?

Q.4(a) How many edges does a tree with 10,000 vertices have?

Q.4(b) Find the particular solution for the given recurrence relation

$$a_n - 2a_{n-1} = 3 \cdot 2^n$$

Q.5(a) Show the validity of the following arguments "If Gora gets the job and works hard, he will be promoted. If Gora gets promotion, then he will be happy. He will not be happy. Therefore, either he will not get the job or he will not work hard."

5(b) Write the following statements in the symbolic form

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- i) If Avi is not in a good mood or he is not busy, then he will go to Delhi.
- ii) If Satya knows Java and C++, then he will get a job.

Q.6 (a) Show that $f(x) = x^2 + 4x + 1$ is $O(x^2)$

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Q.6 b) Prove that if $f(x)$ is $O(g(x))$. Then $g(x) = \Omega(f(x))$

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