PVP 19

Code: 19BS1302

II B.Tech - I Semester – Regular Examinations – MARCH 2021

ENGINEERING MATHEMATICS – III
(Discrete Mathematical Structures)
(Common to CSE, IT)

Duration: 3 hours　　　　　　　　　　Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place

PART – A

1. a) Show that $\sim(P \rightarrow Q) \equiv P \wedge \sim Q$ by constructing the truth table.

b) Symbolize the statement: Some integers are prime numbers.

c) Solve the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 0,\ n \geq 2$

d) Let $R = \{(1,1), (1,2), (2,3), (3,3), (3,4)\}$ be a relation on $A = \{1, 2, 3, 4\}$. Find R^2.

e) Define Tree with an example.

PART – B

UNIT – I

2. a) Prove that $[P \rightarrow (Q \rightarrow R)] \rightarrow [(P \rightarrow Q) \rightarrow (P \rightarrow R)]$ is a tautology. 6 M

b) Obtain the principal conjunctive normal form of
$$[(P \rightarrow Q) \wedge \sim(\sim Q \vee \sim P)]$$ 6 M

OR

3. a) Prove that $\sim(P \wedge Q) \rightarrow [\sim P \vee (\sim P \vee Q)] \Leftrightarrow (\sim P \vee Q)$ 6 M

b) Obtain a disjunctive normal form of $[Q \vee (P \wedge R)] \wedge \sim [(P \vee Q) \wedge R]$ 6 M

UNIT – II

4. a) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q$, $Q \rightarrow R$, $P \rightarrow M$ and ~M 6 M

b) Verify the validity of the following argument:
Tigers are dangerous
There are tigers
Therefore, there are dangerous animals 6 M

OR

5. a) Prove that $(\forall x)(P(x)) \vee (\forall x)(Q(x)) \rightarrow (\forall x)(P(x) \vee Q(x))$ is logically valid 6 M

b) By indirect proof, show that
P→Q, Q→R, $\sim(P \wedge R)$, $(P \vee R) \Rightarrow R$ 6 M

UNIT-III

6. a) Solve the recurrence relation $a_n - 4a_{n-1} + 4a_{n-2} = 0,\ n \geq 2$ with $a_0 = \frac{5}{2}$ and $a_1 = 8$ using the characteristic roots. 6 M

b) Solve $a_r - 6a_{r-1} + 8a_{r-2} = 9,\ r \geq 2$ with $a_0 = 10$ and $a_1 = 25.$ 6 M

OR

7. a) Find the general solution of $a_n - 7a_{n-1} + 10a_{n-2} = 7 \cdot 3^n,\ n \geq 2$ 6 M

b) Solve $a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0,\ n \geq 3$ with $a_0 = 1,\ a_1 = 4$ and $a_2 = 8$ using the characteristic roots. 6 M

UNIT – IV

8. a) Let $R = \{(a,b),(b,c),(c,d),(b,a)\}$ be a relation on $A = \{a,b,c,d\}$. Find the transitive closure of R. 6 M

   b) Let z denote the set of integers and the relation R on z be defined by aRb if and only if $a-b$ is an integer. Prove that R is an equivalence relation. 6 M

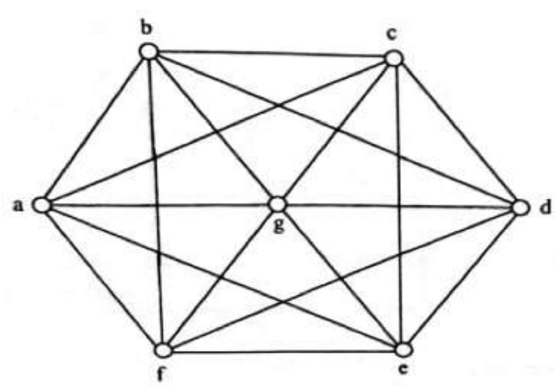
OR

9. a) Let R be a relation on $A = \{1,\ 2,\ 3,\ 4,\ 6\}$ defined by aRb if and only if a is a multiple of b. Represent the relation matrix for R and draw its digraph. 6 M

   b) Let $P(S)$ denote the power set defined on $S = \{1,\ 2,\ 3\}$. The relation R on $P(S)$ defined by $X\,R\,Y$ if and only if $X \subseteq Y$. Show that R is a partial order on $P(S)$. Draw its Hasse diagram. 6 M

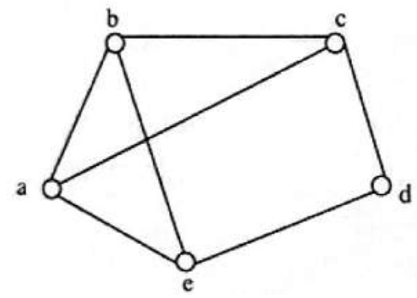
UNIT – V

10. a) Check whether the following graph is planar or not. Justify your answer



6 M

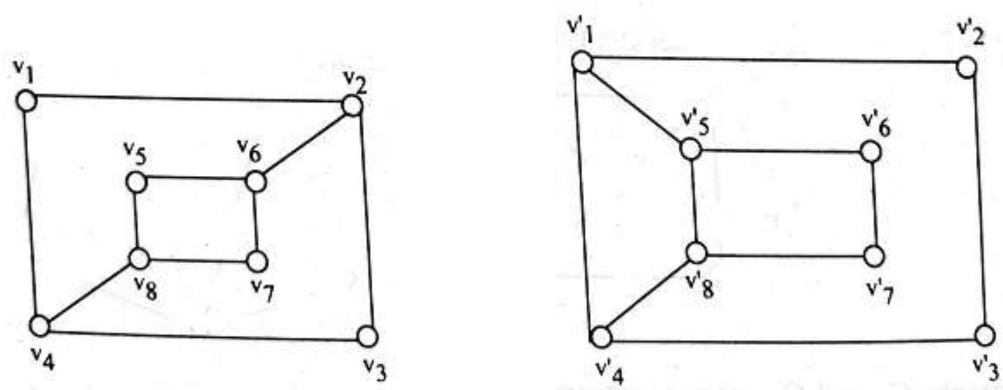
b) Check whether the following graph has an Euler circuit. Construct such a circuit if it exists



6 M

OR

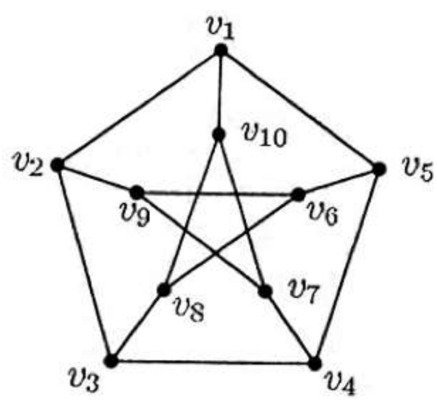
11. a) Check whether the following graphs are isomorphic or not. Justify your answer



6 M

G *G'*

b) Find the chromatic number of the following graph



6 M