

Code No: 07A3BS04

R07**Set No. 2**

II B.Tech I Semester Examinations, MAY 2011
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
Common to Information Technology, Computer Science And Engineering,
Computer Science And Systems Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

- Prove that in any non directed graph there is even no of vertices of odd degree
 - is there a graph with degree sequence (1, 3, 3, 3, 5, 6, 6)
 - is there a simple graph with degree sequence (1, 1, 3, 3, 3, 5, 5, 6). [8+4+4]
- Show that the proposition: $\sim P \rightarrow (P \rightarrow Q)$ is a universally valid formula.
 - Prove the implication: $(P \rightarrow (Q \rightarrow R)) \Rightarrow (P \rightarrow Q) \rightarrow (P \rightarrow R)$. [8+8]
- Consider the semigroups: $(S, *_1)$ and $(T, *_2)$, where $S = \{a, b, c\}$, $T = \{x, y, z\}$ and $*_1$ and $*_2$ are defined by the following tables:

$*_1$	a	b	c
a	a	b	c
d	b	c	a
c	c	a	b

$*_2$	x	y	z
x	z	x	y
y	x	y	z
z	y	z	x

Let the function $f: S \rightarrow T$ defined by: $f(a) = y$, $f(b) = x$, $f(c) = z$. Show that f is an isomorphism. [16]

- Find the inverse of the following functions:
 - $f(x) = \frac{10}{\sqrt[5]{7-3x}}$
 - $f(x) = 4e^{(6x+2)}$
 - Draw the Hasse diagram for the relation R on $A = \{1, 2, 3, 4, 5\}$, whose relation matrix is given below: [8+8]
$$M_R = \begin{pmatrix} 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$
- Using propositional logic, prove the validity of the following argument:
 $P \rightarrow (Q \rightarrow R), Q \rightarrow (R \rightarrow S) \Rightarrow P \rightarrow (Q \rightarrow S)$
 - Determine the validity of the following arguments using propositional logic:
"If today is Sunday, then yesterday was Saturday. Yesterday was Saturday. Therefore, Today is Sunday". [8+8]
- There are 30 girls and 35 boys in the junior's class while there are 25 girls and 20 boys in the senior's class. In how many ways can a committee of 10 be chosen so that there are exactly 5 girls and 3 juniors on the committee?

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- (b) How many 5 digit mobile numbers have one or more repeated digits? [8+8]
7. Show that $(1-4x)^{-1/2}$ generates the sequence $C(2n,n)$, $n \in \mathbb{N}$. [16]
8. (a) Find a self complementary simple graph with 5 vertices.
(b) Show that the figure 6b is self-complementary. [8+8]

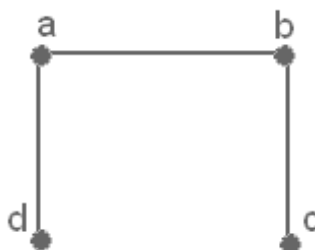


Figure 6b

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R07**Set No. 4**

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1. Show that $(1-4x)^{-1/2}$ generates the sequence $C(2n, n)$, $n \in \mathbb{N}$. [16]
2. (a) Find a self complementary simple graph with 5 vertices.
 (b) Show that the figure 6b is self-complementary. [8+8]

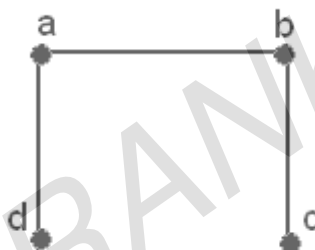


Figure 6b

3. (a) Show that the proposition: $\sim P \rightarrow (P \rightarrow Q)$ is a universally valid formula.
 (b) Prove the implication: $(P \rightarrow (Q \rightarrow R)) \Rightarrow (P \rightarrow Q) \rightarrow (P \rightarrow R)$. [8+8]
4. (a) There are 30 girls and 35 boys in the junior's class while there are 25 girls and 20 boys in the senior's class. In how many ways can a committee of 10 be chosen so that there are exactly 5 girls and 3 juniors on the committee?
 (b) How many 5 digit mobile numbers have one or more repeated digits? [8+8]
5. Consider the semigroups: $(S, *_1)$ and $(T, *_2)$, where $S = \{a, b, c\}$, $T = \{x, y, z\}$ and $*_1$ and $*_2$ are defined by the following tables:

$*_1$	a	b	c
a	a	b	c
d	b	c	a
c	c	a	b

$*_2$	x	y	z
x	z	x	y
y	x	y	z
z	y	z	x

Let the function $f: S \rightarrow T$ defined by: $f(a) = y$, $f(b) = x$, $f(c) = z$. Show that f is an isomorphism. [16]

6. (a) Using propositional logic, prove the validity of the following argument:
 $P \rightarrow (Q \rightarrow R), Q \rightarrow (R \rightarrow S) \Rightarrow P \rightarrow (Q \rightarrow S)$
 (b) Determine the validity of the following arguments using propositional logic:
 "If today is Sunday, then yesterday was Saturday. Yesterday was Saturday.
 Therefore, Today is Sunday". [8+8]

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7. (a) Find the inverse of the following functions:

i. $f(x) = \frac{10}{\sqrt[5]{7-3x}}$

ii. $f(x) = 4e^{(6x+2)}$.

(b) Draw the Hasse diagram for the relation R on $A = \{1, 2, 3, 4, 5\}$, whose relation matrix is given below: [8+8]

$$M_R = \begin{pmatrix} 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

8. (a) Prove that in any non directed graph there is even no of vertices of odd degree

(b) is there a graph with degree sequence (1, 3, 3, 3, 5, 6, 6)

(c) is there a simple graph with degree sequence (1, 1, 3, 3, 3, 5, 5, 6). [8+4+4]

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R07**Set No. 1**

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1. Show that $(1-4x)^{-1/2}$ generates the sequence $C(2n, n)$, $n \in \mathbb{N}$. [16]
2. (a) There are 30 girls and 35 boys in the junior's class while there are 25 girls and 20 boys in the senior's class. In how many ways can a committee of 10 be chosen so that there are exactly 5 girls and 3 juniors on the committee?
 (b) How many 5 digit mobile numbers have one or more repeated digits? [8+8]
3. Consider the semigroups: $(S, *_1)$ and $(T, *_2)$, where $S = \{a, b, c\}$, $T = \{x, y, z\}$ and $*_1$ and $*_2$ are defined by the following tables:

$*_1$	a	b	c
a	a	b	c
d	b	c	a
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$*_2$	x	y	z
x	z	x	y
y	x	y	z
z	y	z	x

Let the function $f: S \rightarrow T$ defined by: $f(a) = y$, $f(b) = x$, $f(c) = z$. Show that f is an isomorphism. [16]

4. (a) Show that the proposition: $\sim P \rightarrow (P \rightarrow Q)$ is a universally valid formula.
 (b) Prove the implication: $(P \rightarrow (Q \rightarrow R)) \Rightarrow (P \rightarrow Q) \rightarrow (P \rightarrow R)$. [8+8]
5. (a) Prove that in any non directed graph there is even no of vertices of odd degree
 (b) is there a graph with degree sequence (1, 3, 3, 3, 5, 6, 6)
 (c) is there a simple graph with degree sequence (1, 1, 3, 3, 3, 5, 5, 6). [8+4+4]
6. (a) Find the inverse of the following functions:
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$$M_R = \begin{pmatrix} 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

7. (a) Find a self complementary simple graph with 5 vertices.

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(b) Show that the figure 6b is self-complementary.

[8+8]

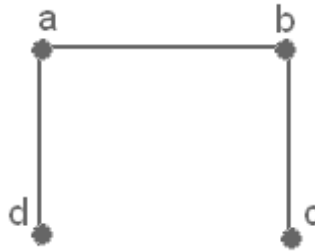


Figure 6b

8. (a) Using propositional logic, prove the validity of the following argument:
 $P \rightarrow (Q \rightarrow R), Q \rightarrow (R \rightarrow S) \Rightarrow P \rightarrow (Q \rightarrow S)$
- (b) Determine the validity of the following arguments using propositional logic:
"If today is Sunday, then yesterday was Saturday. Yesterday was Saturday. Therefore, Today is Sunday".

[8+8]

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R07**Set No. 3**

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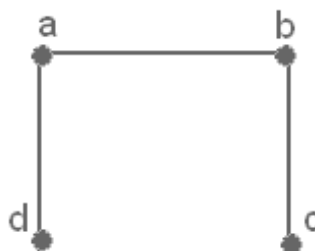


Figure 6b

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Set No. 3

7. (a) Find the inverse of the following functions:

i. $f(x) = \frac{10}{\sqrt[5]{7-3x}}$

ii. $f(x) = 4e^{(6x+2)}$.

(b) Draw the Hasse diagram for the relation R on $A = \{1, 2, 3, 4, 5\}$, whose relation matrix is given below: [8+8]

$$M_R = \begin{pmatrix} 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

8. (a) Prove that in any non directed graph there is even no of vertices of odd degree

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