# FIRST TERM EXAMINATION

## THIRD SEMESTER [B.TECH.], SEPTEMBER 2014

## FOUNDATION OF COMPUTER SCIENCE (ETCS-203)

*Time : 1½ hours* *Maximum Marks : 30*

**Note:** *Question No. 1 is compulsory. Attempt any two more Questions from the rest.*

**Question 1.**

*(a) Show that the proposition $\neg (p \wedge q)$ and $\neg p \vee \neg q$ are logically equivalent.* *(2 * 5)*

*(b) Determine the contra positive of the statement "If John is a poet, then he is poor."*

*(c) Show that $n[p\,[p\,[p(\phi)]]] = 4$.*

*(d) Explain pigeonhole principle.*

*(e) Let A = {1, 2, 3, 4, 5}. Determine the truth value of the following statements:*

*(i) $(\exists\ x \in A)\ (x + 3 = 10)$* *(ii) $(\forall\ x \in A)\ (x + 3 < 10)$*

**Question 2.**

*(a) Given that*

$C1:\ P \rightarrow S$

$C2:\ S \rightarrow U$

$C3:\ P$

$C4:\ U$

*Show that C4 is a logical consequence of C1, C2 and C3.* *(5 × 2)*

*(b) Use mathematical induction to prove that*

*$1 + 2 + 3 + 4 \ldots + n = n\,(n + 1)/2$ for any integer $n \geq 1$.*

**Question 3.**

*(a) Test the validity of the following argument.* *(5 × 2)*

*If two sides of a triangle are equal, then the opposite angles are equal.*

*Two sides of a triangle are not equal.*

*Therefore, the opposite angles are not equal.*

*(b) Use the method of proof by contradiction to show that 3 is irrational.*

**Question 4.**

*(a) Give examples of relations R on A = {1, 2, 3} having the stated property.* *(4 + 6)*

*(i) R is both symmetric and anti-symmetric.*

*(ii) R is neither symmetric nor anti-symmetric.*

*(b) Let R be an equivalence relation on set A, then prove that $R^{-1}$ is also an equivalence relation on set A.*

# SECOND TERM EXAMINATION

## THIRD SEMESTER [B.TECH.], NOVEMBER 2014

## FOUNDATION OF COMPUTER SCIENCE (ETCS-203)

*Time : 1½ hours* *Maximum Marks : 30*

**Note:** *Question No. 1 is compulsory. Attempt any two more Questions from the rest.*

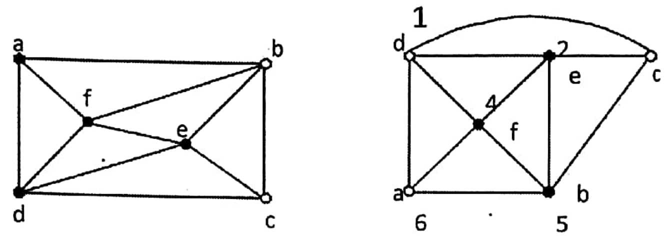
**Question 1.**

***(a)*** ***Suppose that a connected planar simple graph has 20 vertices, each of degree 3. Into how many regions does a representation of this planar graph split the plane ?*** ***(2 × 5)***

***(b)*** ***Define normal subgroup and give an example.***

***(c)*** ***Define lattice and give an example.***

***(d)*** ***Define isomorphic graphs. Determine whether the given pair of graphs is isomorphic.***




***(e)*** ***Define chromatic number of graph. Find the chromatic number of the given graph.***

**Question 2.**

***(a)*** ***Prove Euler's Formula.*** ***(6 + 4)***

***(b)*** ***Let A = {1, 2} and B = {a, b}. Find all functions f: A → B and for each such function, determine whether it is one to one, onto, both or neither.***

**Question 3.**

***(a)*** ***Answer these questions for the poset ({3, 5, 9, 15, 24, 45}, |).*** ***(5 × 2)***

***(i) Find the maximal elements.*** ***(ii) Find the minimal elements.***

***(iii) Is there a greatest element ?*** ***(iv) Is there a least element ?***

***(b)*** ***Consider the group G = {1, 2, 3, 4, 5, 6} under multiplication modulo 7.***

***(i)*** ***Find the multiplication table of G.***

***(ii)*** ***Find $2^{-1}$, $3^{-1}$.***

***(iii)*** ***Find the orders and subgroups generated by 2.***

***(iv)*** ***Is G cyclic ?***

**Question 4.**

***(a)*** ***Solve the recurrence relation***

$$a_n = 2a_{n-1};\ a_0 = 1$$

***(b)*** ***Let R be an equivalence relation on set A, then prove that $R^{-1}$ is also an equivalence relation on set A.***

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# Second Term Examination

3rd Sem [B.Tech], Nov. 2015
Paper Code: ETCS 203

Subject: Foundations of Computer Science
Max. Marks: 30

**Note: Attempt any 3 questions. Ques No. 1 is Compulsory. Each Question carries 10 marks.**

Q1.

a) Prove by mathematical Induction: for all $n \geq 1$, $n^3 + 2n$ is a multiple of 3.

b) Identify homogenous and non homogenous recurrence relation:

i. $a_n - \sqrt{a_{n-1}} + (a_{n-1})^2 = 0$ H

ii. $a_n - 5a_{n-1} + n(a_{n-2}) = 0$ N

iii. $a_n = \sin a_{n-1} + \cos a_{n-2} + \sin a_{n-3} + \cos a_{n-4} + \ldots + e^n$ N

iv. $a_n = a_{n-1} + a_{n-2} + a_{n-3} + \ldots a_0$ H

c) What is Generating Function? Explain with example.

d) What is difference between cut set and cut edge? Explain with example.

e) What is an Abelian group? (2x5 marks)

Q2.

a) Find solution of non homogenous recurrence relation $a_n - 4a_{n-1} + 4a_{n-2} = 2^n$ $2^{n-1} n^2 + (A + Bn)2^n$

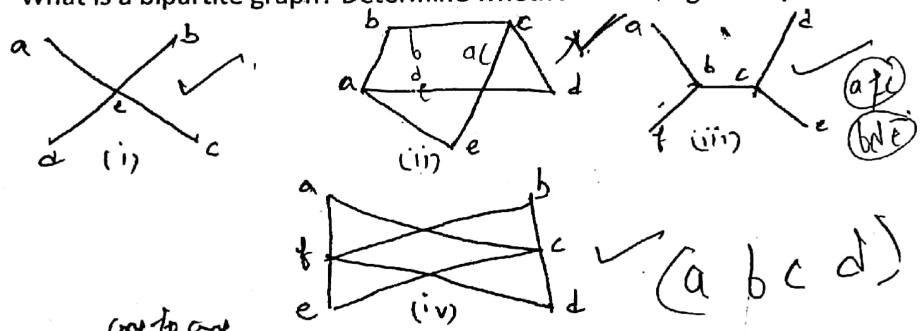
b) Solve the recurrence relation $a_n - 2a_{n-1} + a_{n-2} = 2^n$ by generating functions with initial conditions $a_0 = 2$ and $a_1 = 1$. $1 + 4n + 2^n$ (6+4 marks)

Q3.

a) Define planar graph. Give the proof of Euler's formula for connected planar graph. $r = e - v + 2$

b) What is a bipartite graph? Determine whether following are bipartite with reason.

a b c d (t)



(a b c d) (f e)

c) What are isomorphic and homomorphic graphs. What is connected graph, regular graph and complete graph? Give examples. (4+3+3 marks)

Q4.

a) Let Q be a set of positive rational numbers which can be expressed in form $2^a 3^b$, where a and b are integers. Prove that (Q, .) is a group where . is a multiplication operator.

b) What is order of an element in a group? What is a cyclic group? If in a group G, $x^5 = e$, $xyx^{-1} = y^2$ for $x, y \in G$, show that $o(y) = 31$. (5+ 5 marks)

Ans 1) $f(n) = n^3 + 2n$

$f(1) = 1 + 2 = 3$ prove for 1

Assume true for $f(k) = k^3 + 2k \Rightarrow 3k$

$f(k+1) = (k+1)^3 + 2(k+1) \Rightarrow k^3 + 1 + 3k(k+1) + 2k + 2$

$= k^3 + 1 + 3k^2 + 3k + 2k + 2$

$k^3 + 3k^2 + 3k + 3 + 2k$

$k^3 + 3k + 3k^2 + 3 + 2k$

$k^3 + 2k + 3k + 3k^2 + 3 \Rightarrow 3k + 3k + 3k^2 + 3$

$3(2k + 3k^2 + 1) \Rightarrow 3$

## First Term Examination

3rd Sem [B.Tech], Sept. 2015
Paper Code: ETCS 203

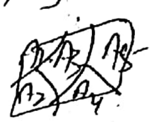
Subject: Fundamentals of Computing
Max. Marks: 30

**Note: Attempt any 3 questions. Ques No. 1 is Compulsory. Each Question carries 10 marks.**

Q1.

a) What is a Partition of a set? Explain with example.

$A = \{1, 2, 3, 4, 5\}$
$A_1 = \{1, 3, 4\}$
$A_2 = \{2, 5\}$



b) How would you bracket the formulas to correctly interpret them

i. $(p \to q) \leftrightarrow (\sim p \vee q)$

ii. $[(p \oplus q \wedge r) \to (\sim p \vee q)] \leftrightarrow (p \wedge r)$

c) Prove that sum of two odd integers is even.

d) How many no.s between 4000 and 9000 can be formed using digits 2,4,7,9, if each digit may be repeated.

e) Give matrix representation of relation R on set A ={a,b,c,d} and B={1,2,3}
R={(a,1),(a,3),(b,2),(b,3),(c,1),(d,1),(d,2),(d,3)}

(2x5 marks)

$$\begin{array}{c|ccc} & 1 & 2 & 3 \\ \hline a & 1 & 0 & 1 \\ b & 0 & 1 & 1 \\ c & 1 & 0 & 0 \\ d & 1 & 1 & 1 \end{array}$$

$(\sim p \vee \sim q) \to [p \leftrightarrow \sim q]$
$\equiv \sim[\sim p \vee \sim q] \vee [p \leftrightarrow \sim q]$
$[p \wedge q] \vee [(p \wedge \sim q) \vee (\sim p \wedge q)]$

Q2.

a) What is PCNF and PDNF. Derive PDNF for $(\sim p \vee \sim q) \to (p \leftrightarrow \sim q)$ without constructing truth table.

$(p \wedge q) \vee (p \wedge \sim q) \vee (\sim p \wedge q)$

b) Using rules of inference prove that s is a valid conclusion from premises $p \to q$, $p \to r$, $\sim(q \wedge r)$, $(s \vee p)$ (3x2 marks)

using (1) & (2) $p \to q \wedge p \to r \equiv p \to (q \wedge r)$ — (5)

~~$\sim(q \wedge r)$~~

using 3 & 5 $\sim(q \wedge r)$, $[p \to (q \wedge r)]$ Modus tollen $\therefore \sim p$ — (6)

using 4 & 6 $s \vee p$, $\sim p$ Disjunctive syllogism $\therefore s$ hence valid con

Q3.

a) Prove that $\sqrt{3}$ is irrational by indirect proof of contradiction. 5 marks

b)

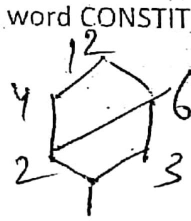
i. What is pigeonhole principle? Give its proof.

ii. How many permutations can be made with letters of word CONSTITUTION when consonants and vowels occur alternately?

2.5 x2 marks

$\frac{4 \times 7!}{3!2!} \times \frac{5!}{2!2!}$

Q4.



a) Give the hasse diagram of $D_{12}$ if $D_n$={x:x|n such that x$\in$ N}.

b) What is a Lattice? Explain Least Upperbound and Greatest LowerBound with example.

(7.5+2.5)

Ans 1 c) Let p = Two integers a, b are odd
q = sum of odd integers is even

by direct method

Let p is true i.e. $a = 2k+1$, $b = 2l+1$
sum $= a + b$
$= 2k+1 + 2l+1$
$= 2k + 2l + 2$
$= 2(k+l+1)$

20/9/16

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First-Term Examination

B.Tech- 3rd sem September 2016

Paper code: ETCS 203 Subject:Foundation of computer science

Time :1 hour 30 min Max Marks:30

**Note : Q no 1 is compulsory and attempt any two more question from the remaining questions**

Q. no1 (2*5=10)

(a) What is pigeonhole principle? Explain in brief.

(b) Write the condition of the function to be surjective ?

(c) Compute truth table of $(p \leftrightarrow q) \vee (\sim q \leftrightarrow r)$

(d) Represent the statement using predicate and quantifier and negate it

For all the real number x if $x > 5$ then $x^2 > 25$

(e) Define lattices ?

Q no 2

(a) Show that $\sim p \wedge (\sim q \wedge r) \vee (q \wedge r) \vee (p \wedge r) \equiv r$ (5)

(b) Prove the statement " if x is an integer and $x^2$ is even then x is also even . (5)

Q no 3

(a) In how many ways can a team of 11 cricketers be chosen from 6 bowlers ,4 wicket keepers and 11 batsmen to give a majority of batsmen if atleast 4 bowlers are to be included and there is one wicket keeper? (5)

(b) Let A={a,b,c,d} and R be the relation on set A that has the matrix representation given as (5)

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

Construct the diagraph of R and find the indegree and outdegree of all the vertices.

Q. no 4 (5*2=10)

(a) Check the validity of the argument. If the races are fixed or the casinos are cooked , then the tourist trade will decrease, if the tourist trade decreases, then the police will be happy. The police force is never happy . therefore the races are not fixed.

(b) What is the necessary condition for the relation to become poset ? explain with example.

CO1 - 7
CO2 - 24
CO3 9

Please write your Roll No. immediately Roll No.....................................

**First-Term Examination**

B.Tech - 3rd sem September 2017

Paper code: ETCS 203 Subject: Foundation of Computer Science

Time : 1 hour 30 min Max Marks:30

**Note : Q no 1 is compulsory and attempt any two more question from the remaining questions**

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Q. no1 (2*5=10)

CO1 (a) What is Principle of Inclusion and Exclusion ? Explain in brief. $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

CO3 (b) What is Function? Write the condition of the Function to be injective ? every element in A must have only one image in B one b

$f: A \to B$ $f(a) = b$ $\forall a \in A$, $b \in B$; $f$ is $A \to B$ 1-1 if $f(a_1) = f(a_2) \Rightarrow a_1 = a_2$

CO2 (c) Find the Converse and contrapositive of the Statement "If x is positive then x ≠ 0"

converse → If $x \neq 0$ then $x$ is +ve

contrapositive → If $x = 0$ then $x$ is -ve

CO2 (d) Represent the statement using predicate and quantifier and negate it

For all the real number x if x > 5 then $x^2 > 25$ Let x be real no. negation $\neg(\forall x \in R(P(x) \to Q(x)))$

$\forall x P(x) \to Q(x)$ P(x) be $x > 5$ $\exists x \in R \neg(P(x) \to Q(x))$

Q(x) be $x^2 > 25$

CO3 (e) Define lattices ?

A Poset in which every pair of element has both LUB & GLB is called Lattice

Q no 2

CO2 (a) Show that $((p \to q) \wedge (q \to r)) \to (p \to r)$ is tautology By Rules of Preposition. (5)

CO2 (b) Prove that "if x,y ∈ Z (set of integer)such that xy is odd then both x and y are odd, by proving its contrapositive (5)

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Q no 3

CO2 (a) In how many ways can a team of 11 cricketers be chosen from 6 bowlers ,4 wicket keepers and 11 batsmen to give a majority of batsmen if atleast 4 bowlers are to be included and there is one wicket keeper? (5)

CO3 (b) Let A ={1,2,3,4,6} and R is a Relation on the Set A Such that aRb if a divides b

(1,1)(1,2)(1,3)(1,4)(1,6)(2,4)(2,6)(3,6)(4,4) (2,4) (2,6) (3,6) (6,6)

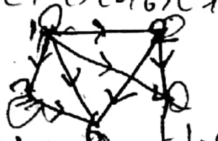
Find (i) Relation R

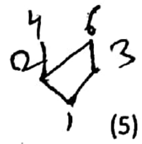
(ii) Diagraph of R

(iii) Find Adjacency matrix of R

(iv) Indergree and outdegree of each node

(v) Find its Hasse diagram (5)





Indegree Outdegree

1 1 5
2 2 2
3 2 2
4 3 1
6 4 1

Q. no 4

CO2 (a) Prove the validity of the argument "if I get the job and work hard, then I will get promoted. If I get promoted, then I will be happy .I will not be happy. Therefore, either I will not get the job or I will not work hard". (5)

CO1 (b) Out of the 200 Students, 50 of them take the course in mathematics, 140 of them take the course economics & 24 of them take both the course. Since both courses have schedule examinations for the following day, only those students who are not taken any of these courses will be able to go to see movie. How many students will be able to go to see movie. (5)

$n(M) = 50$, $n(E) = 140$, $n(M \cap E) = 24$

$n(M \cup E) = 50 + 140 - 24$

$\Rightarrow 166$

No. of students who will be able to go to movie $= 200 - 166$

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