Total No. of Questions : 5]

SEAT No. :

P692

[Total No. of Pages : 7

[4239] - 103

M.Sc.

COMPUTER SCIENCE

CS - 103 : Distributed Database concepts

(2011 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***All questions carry equal marks.***

SECTION - I

Q1) Answer any EIGHT of the following : **[8 × 2 = 16]**

a) Distributed data processing uses divide & conquer method. Comment.

b) Define architectural model of any system. List any two approaches based on which the model can be described.

c) Write one advantage & one disadvantage of fragmentation.

d) What is the complexity of following relational algebra operations :

i) Semijoin

ii) Cartesian product

e) What are the main reasons for a query getting rejected?

f) Define :

i) Linear Join Tree

ii) Bushy Join Tree

g) How distributed INGRES algorithm differs from R* algorithm in terms of objective function?

h) List the goals of Transaction management.

i) Discuss the classification criteria of concurrency control approaches.

j) Define steady state availability of a system and parameters used in formulating the same.

P.T.O.

Q2) Attempt any four : **[4 × 4 = 16]**

a) Providing transparency is necessary in DDBMS. Comment.

b) Write a short note on Distributed catalog management.

c) Bottom-up design approach is suitable. When a database system is to be designed from scratch. Comment.

d) Dynamic query optimization approach is best for ad-hoc queries. Justify true or false.

e) Query analysis phase enables rejection of normalized queries, for which further processing is either impossible or unnecessary. Comment.

Q3) Solve any four : **[4 × 4 = 16]**

a) Let Q = $\{q_1, q_2, q_3, q_4, q_5\}$ be a set of queries. A = $\{A_1, A_2, A_3, A_4, A_5\}$ be a set of attributes & S = $\{S_1, S_2, S_3\}$ be a set of sites.
matrix (a) describes attribute usage values & matrix (b) gives application access frequencies. Assume that $ref_i(q_k) = 1 \forall q_k$ & S_i and that A_4 is the key attribute. Use Bond Energy & vertical partitioning algorithm to obtain vertical fragment of set of attributes in A.

matrix (a)

	A_1	A_2	A_3	A_4	A_5
q_1	0	1	1	1	0
q_2	1	1	1	0	0
q_3	1	1	0	0	0
q_4	0	0	0	1	1
q_5	0	0	1	1	1

matrix (b)

	S_1	S_2	S_3
q_1	20	4	0
q_2	25	10	0
q_3	15	0	0
q_4	0	0	30
q_5	0	20	25

b) Consider a data item x

Let RTS (x) = 25 and WTS (x) = 20. Let the pair $\langle R i(x), TS\rangle$ and $\langle W i(x), TS\rangle$ denote a read and write request of transaction Ti on the item x with timestamp TS.

Indicate the behavior of the basic timestamp method with the following set of requests :

$\langle R_1(x), 19\rangle$, $\langle R_2(x), 22\rangle$, $\langle W_3(x), 21\rangle$,

$\langle W_4(x), 23\rangle$, $\langle R_5(x), 28\rangle$, $\langle W_6(x), 27\rangle$

c) Consider the following query :

```
Select    ename, sal

From    EMP, PROJ, ASG, PAY

Where  EMP. eno = ASG . eno

   and  EMP. Title = PAY. Title

   and  (budget > 200000 or dur > 24)

   and  ASG . Pno = PROJ. pno
```

Compose the selection predicate corresponding to the where clause and transform it, using idempotency rules, into the simplest form.
Furthermore, compose an operator tree corresponding to query & transform it, using relational algebra transformations rules, to a form that is optimal with respect to total execution time by considering only selectivity factors of operations.

d) There are two relations in DDBMS

DOCTOR (dno, dname, age, specialization, hno)

HOSPITAL (hno, hname, location)

size (DOCTOR) = 5000 tuples & SIZE (HOSPITAL) = 100 tuples.

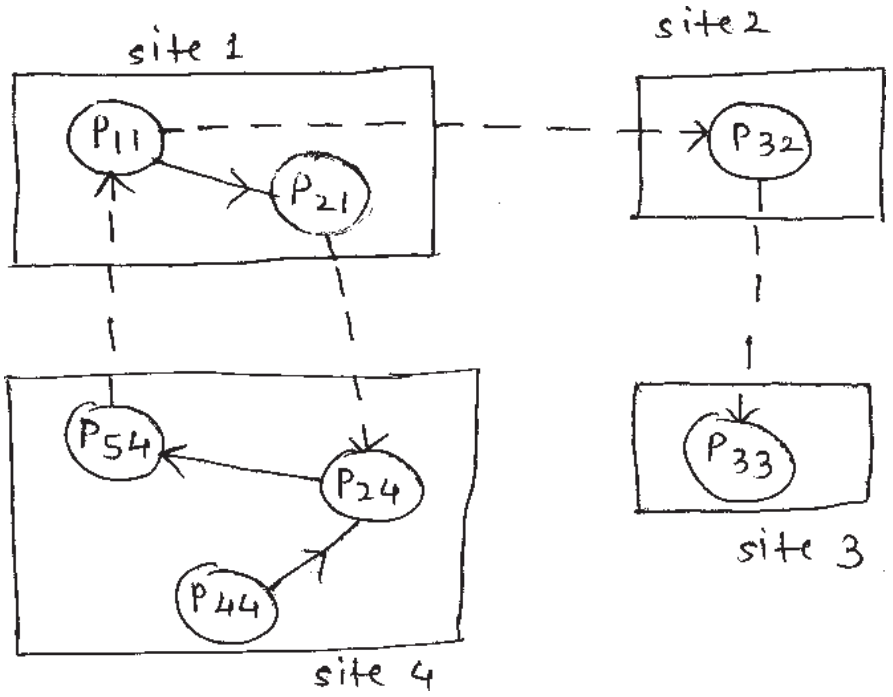
DOCTOR is stored at site 1, HOSPITAL is stored at site 2. The query is executed at site 3 :

"Find out names of doctors of those hospitals which are located in pune".

Show at least two ways of evaluation of query. Assume that there are 40 hospitals satisfying the condition, tuple access time is 1 unit, tuple transmission time is 5 units.

Find out cost of evaluation, (in terms of time) of query in both the alternatives.

e) Consider the following DWFG:

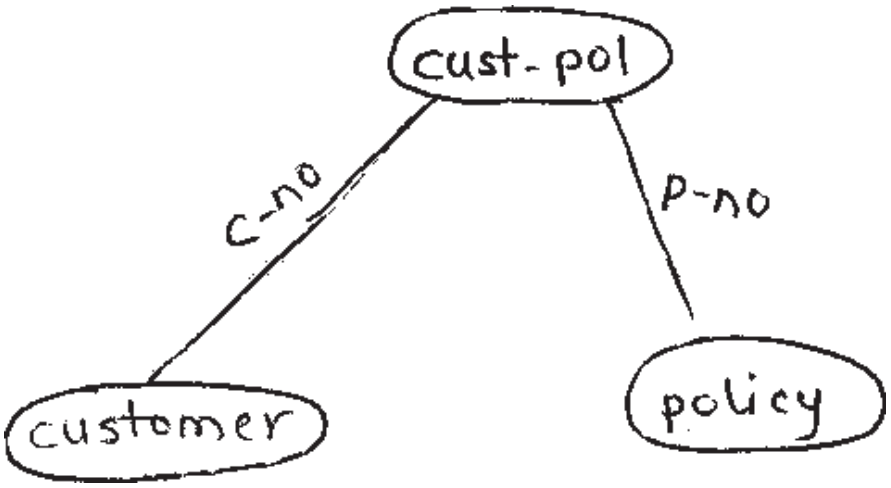


Check if deadlock exists in system. If so, find out the sites involved in deadlock.

Q4) Attempt any four : **[4 × 4 = 16]**

a) How complexity of relational algebra operations affect query execution time?

b) Consider the join graph in the following diagram :



The fragmentation of the three relations is done & following table shows the number of tuples of each of the relation stored at three different sites : S_1, S_2 & S_3.

	S_1	S_2	S_3
Customer	300	200	600
Policy	-	150	-
cust-pol	1500	700	

size (customer $\bowtie$ cust-pol) = 2000

size (policy $\bowtie$ cust - pol) = 4000

Apply algorithm of distributed INGRES for broadcast network so that communication time is minimized.

c) Consider the following relations :

SUPPLIER (sno, sname, city)

PARTS (pno, pname, descr, price, sno)

PARTS is partitioned horizontally as :

$PARTS_1 = \sigma$ price < 100 (PARTS)

$PARTS_2 = \sigma$ price > = 100$\wedge$ price < 500 (PARTS)

$PARTS_3 = \sigma$ price > = 500 (PARTS)

SUPPLIER relation is also partitioned horizontally as :

$SUPPLIER_1 = \sigma$ city = 'pune' (SUPPLIER)

$SUPPLIER_2 = \sigma$ city = 'mumbai' (SUPPLIER)

Draw a join graph of SUPPLIER $\bowtie$ PARTS. Is the graph simple or partitioned? If it is partitioned, modify the fragments of PARTS & SUPPLIER so that the join graph will be simple.

d) Let objects *x* & *y* be stored at site 1, and objects z & w be stored at site 2. Determine, for each of the following executions, whether the execution is serializable or not. Justify your answer :

i) Execution 1 : $S_1 : R_i(x)\ R_j(x)\ W_j(y)\ W_i(x)$

$S_2 : R_i(w)\ R_j(z)\ W_j(w)\ W_i(w)$

ii) Execution 2 : $S_1 : R_i(x)\ R_j(x)\ W_j(y)\ W_i(y)$

$S_2 : W_i(z)$

e) Explain the fundamental approaches to construct a reliable system.

Q5) Attempt any FOUR : **[4 × 4 = 16]**

a) When a query is reduced by horizontal fragmentation with join, reduced query is always better than generic query. Comment.

b) How does Distributed Transaction manager deal with multiple copies of data, when concurrency control is based on locking?

c) Explain hill-climbing method of Query optimization.

d) Write a short note on failure unique to distributed environment.

e) How the correctness rules can be applied to primary & derived horizontal fragmentation?

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Total No. of Questions : 5]

SEAT No. : ____

P699

[Total No. of Pages : 4

[4239] - 303

M.Sc.

COMPUTER SCIENCE

CS - 303 : Soft Computing

(2011 Pattern) (Sem. - III)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of simple calculator is allowed.***

Q1) Attempt all of the following : **[8 × 2 = 16]**

a) Define fuzzy relation.

b) What is intensification?

c) Given the following two fuzzy sets, find $\overline{\underset{\sim}{A}}$ and $\underset{\sim}{A} \cup \underset{\sim}{B}$.

$$\underset{\sim}{A} = \left\{\frac{0.1}{0} + \frac{0.5}{1} + \frac{1}{2} + \frac{0.6}{3} + \frac{0.2}{4}\right\}$$

$$\underset{\sim}{B} = \left\{\frac{0.2}{0} + \frac{0.5}{1} + \frac{1}{2} + \frac{0.7}{3} + \frac{0.1}{4}\right\}$$

d) State the equation for Gaussian signal function.

e) Clustering is unsupervised learning. Comment.

f) State any two applications of Genetic Algorithms (GA).

g) State any two basic operations of Genetic Algorithm.

h) Draw the diagram of an artificial neuron.

P.T.O.

Q2) Attempt any four of the following : **[4 × 4 = 16]**

a) Define defuzzification. Explain the max membership principle & centroid method of defuzzification.

b) Explain normal & convex fuzzy sets with the help of diagram.

c) How are Genetic algorithms different from traditional methods.

d) Write a note on α - Least mean square learning.

e) Differentiate feedforward & feedback networks.

Q3) Attempt any four of the following : **[4 × 4 = 16]**

a) Consider two fuzzy sets $\underset{\sim}{A}$ & $\underset{\sim}{B}$.

$$\underset{\sim}{A} = \left\{\frac{0.2}{x_1} + \frac{0.8}{x_2} + \frac{0.4}{x_3}\right\}$$

$$\underset{\sim}{B} = \left\{\frac{0.4}{x_1} + \frac{0}{x_2} + \frac{0.1}{x_3}\right\}$$

Find difference of two fuzzy sets. Also apply De Morgan's laws on fuzzy sets.

b) Consider fuzzy relation matrix R

$$R = \begin{bmatrix} 1 & 0.8 & 0 & 0.2 & 0.5 \\ 0.8 & 1 & 0.5 & 0 & 0.2 \\ 0 & 0.5 & 1 & 0.6 & 0 \\ 0.2 & 0 & 0.6 & 1 & 0.5 \\ 0.5 & 0.2 & 0 & 0.5 & 1 \end{bmatrix}$$

Determine the λ - cut relations for the following λ - values on R.

λ_1, $\lambda_{0.5}$, $\lambda_{0.8}$ & $\lambda_{0.3}$

c) Given the following fuzzy numbers and using Zadeh's extension principle, calculate $\underset{\sim}{K} = \underset{\sim}{I}.\underset{\sim}{J}$ and explain why $\underset{\sim}{6}$ is nonconvex.

$$\underset{\sim}{I} = \underset{\sim}{3} = \frac{0.2}{2} + \frac{1}{3} + \frac{0.2}{4}$$

$$\underset{\sim}{J} = \underset{\sim}{2} = \frac{0.1}{1} + \frac{1}{2} + \frac{0.1}{3}$$

d) Given universe X = universe of temperatures = {160, 165, 170, 175, 180, 185, 190, 195} and universe Y = universe of distillate fractions (percentage) = {77, 80, 83, 86, 89, 92, 95, 98} we define fuzzy sets $\underset{\sim}{A}$ & $\underset{\sim}{B}$ on X, Y respectively.

$\underset{\sim}{A}$ = temperature of input stream is hot

$$= \left\{\frac{0}{175} + \frac{0.7}{180} + \frac{1}{185} + \frac{0.4}{190}\right\}$$

$\underset{\sim}{B}$ = separation of mixture is good

$$= \left\{\frac{0}{89} + \frac{0.5}{92} + \frac{0.8}{95} + \frac{1}{98}\right\}$$

Find the proposition, If "temperature is hot" THEN "separation of mixture is good" or $\underset{\sim}{A} \rightarrow \underset{\sim}{B}$

e) Given the following fuzzy sets

$$\underset{\sim}{A} = \text{small} = \left\{\frac{1}{1} + \frac{0.8}{2} + \frac{0.6}{3} + \frac{0.4}{4} + \frac{0.2}{5}\right\}$$

$$\underset{\sim}{B} = \text{large} = \left\{\frac{0.2}{1} + \frac{0.4}{2} + \frac{0.6}{3} + \frac{0.8}{4} + \frac{1}{5}\right\}$$

Find membership function for

i) $\underset{\sim}{A}$ slightly small & $\underset{\sim}{B}$ very large.

ii) $\underset{\sim}{A}$ not very small & $\underset{\sim}{B}$ very large.

Q4) Answer <u>any two</u> of the following : **[2 × 8 = 16]**

a) Differentiate supervise learning & nonsupervise learning. Explain any two application domains of neural network.

b) Define linear separability. Show that the boolean function 'AND' is linearly separable.

c) In a ground transportation system, consider the relationship between number of people moved from point to point & the number of wheels used to accomplish this movement ; i.e. a motorcycle uses two wheels to move one person. Let X be a universe of speeds (miles per hr) at which these systems move people, i. e. X = {5, 30, 50, 100, 300+} let Y be the universe of the number of wheels that the system has. i. e. Y = {2, 4, 8, 10, 16} A fuzzy set fast system on X is fast

$$= \left\{ \frac{0}{5} + \frac{0.1}{30} + \frac{0.3}{50} + \frac{0.8}{100} + \frac{1.0}{300+} \right\}$$

A fuzzy set personally owned on Y is personal

$$= \left\{ \frac{0.7}{2} + \frac{1.0}{4} + \frac{0.1}{8} + \frac{0}{10} + \frac{0}{16} \right\}$$

i) Find a fuzzy relation using the cartesian product relating a fast system to a personal system.

ii) A fuzzy set slow defined on X slow $= \left\{ \frac{1.0}{5} + \frac{0.8}{30} + \frac{0}{50} + \frac{0}{100} + \frac{0}{300} \right\}$

Find a relation between a slow system & the priviously determine relations of (i) using max - min composition.

Q5) Attempt <u>any two</u> of the following : **[2 × 8 = 16]**

a) Let X = {a, b, c, d} Y = {1, 2, 3, 4} and

$$\underset{\sim}{A} = \left\{ \frac{0}{a} + \frac{0.8}{b} + \frac{0.6}{c} + \frac{1}{d} \right\}$$

$$\underset{\sim}{B} = \left\{ \frac{0.2}{1} + \frac{1}{2} + \frac{0.8}{3} + \frac{0}{4} \right\}$$

$$\underset{\sim}{C} = \left\{ \frac{0}{1} + \frac{0.4}{2} + \frac{1}{3} + \frac{0.8}{4} \right\}$$

Determine the implication relations

i) If x is $\underset{\sim}{A}$ THEN y is $\underset{\sim}{B}$

ii) If x is $\underset{\sim}{A}$ THEN y is $\underset{\sim}{B}$ ELSE y is $\underset{\sim}{C}$.

b) Simulate the execution of perceptron learning algorithm for each epoch on the following inputs (1, 0, 0) (1, 0, 1) (1, 1, 0) (1, 1, 1) with weight vector (0, 0, 0) & $\eta = 1$. What is the final weight vector.

c) Explain the basic genetic algorithm. Maximize $f(x) = x^2$ over {0, 1, 2, ...31} with initial x values of (13, 24, 8, 19).

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Total No. of Questions : 5]

SEAT No. :

P680

[Total No. of Pages : 3

[4239] - 11

M.Sc.

COMPUTER SCIENCE

CS-101 : Principles of Programming Languages

(2008 Pattern) (Semester - I)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt all of the following: **[8 × 2 = 16]**

a) Why variables need not be declared in a prolog program before their use?

b) Show how ((2 3)4 (5 6)) is implemented in LISP.

. c) What is the use of cactus stack.

d) State two ways to define type equivalence.

e) What is Lazy evaluation.

f) What is coroutine? How does it differ from a subroutine.

g) Define communication & synchronization.

h) What is coscheduling.

Q2) Attempt any four **[4 × 4 = 16]**

a) What does it mean for a language to be strongly typed & Statically typed. Explain with an example.

b) Discuss contiguous & row-pointer layout of an array with an example.

c) Compare any two languages you know in terms of characteristics of a good language.

d) Reference counts allows both garbage & dangling references to be avoided in most situations. Comment.

e) What is exception handling? How does it bring reliability to a programming language.

P.T.O

Q3) Attempt any four **[4 × 4 = 16]**

a) What is the structure of a subprogram activation at the time, the subprogram is called during execution? Explain.

b) Explain the connection between dynamic method binding & polymorphism.

c) Consider the following pseudocode.

```
x : integer _ _ _ _  global
procedure set_x(n:integer)
        x : = n;
procedure print_x
        write_integer(x);
procedure first
        set_x(1); print_x;
procedure second
        x: integer;
        set_x(2);
        print_x;
main
        set_x(0);
        first ( );
        print_x;
        second ( ) ;
        print_x ;
```

What does this program print if the language uses static scoping? What does it print with dynamic scoping? Why?

d) Describe how virtual functions can be used to achieve the effect of subroutine closures?

e) Explain difference between applicative & normal order evaluation of expression.

Q4) Attempt any four **[4 × 4 = 16]**

a) What is semaphore? What operations does it support.

b) Describe the following terms:

i) Re entrant procedure

ii) Atomic operation.

c) Explain the implementation of multiple inheritance with the help of suitable example and diagram.

d) State six different syntactic constructs commonly used to create new thread of control in a concurrent program? Explain any one.

e) State the difference between static scope & dynamic scope.

Q5) Attempt any four **[4 × 4 = 16]**

a) Define LISP function to rotate a list in right direction till n

b) Define LISP function to find difference of two lists taken as arguments.

c) Write a prolog program to calculate the sum of first n numbers.

d) Write a prolog program to find the last element in a list.

e) Write a prolog program to prove that

A table supports a bottle

- if x is on the top of y, y supports x
- if x is above y & they are touching each other then x is on the top of y.
- a bottle is above the table
- a bottle is touching the table

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Total No. of Questions : 4]

P681

SEAT No. : ____

[Total No. of Pages : 2

[4239] - 12

M.Sc. - I

COMPUTER SCIENCE

CS-102 : Object Oriented Software Engineering

(2008 Pattern) (Semester - I)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data where necessary.***

Q1) Attempt the following: **[8 × 2 = 16]**

a) What do you mean by encapsulation?

b) Draw the diagram for Architecture of UML.

. c) What is a Meta Model?

d) Define the terms

i) Abstract class ii) Fork

e) Which 3 modeling techniques have been united in UML.

f) What are constraints?

g) Give any two benefits of iterative development.

h) Define the elaboration concept.

Q2) Attempt any four of the following: **[4 × 4 = 16]**

a) Define UML. Explain advantages of UML.

b) Discuss the component of activity diagram.

c) Differentiate between aggregation and generalization.

d) Write short note on 'The Booch Method'.

e) List and explain the stereotypes used for modeling and interaction among objects.

P.T.O

Q3) Attempt any four of the following: **[4 × 8 = 32]**

a) Draw a class diagram for 'PLACEMENT Agency'.

b) Prepare an object diagram showing at least 6 relationships among the following object classes, Expression, constant, variable, function argument list, relational operation, team, factor, arithemetic operator, statement, program.

c) Draw state chart and sequence diagram for a telephone line.

d) Draw an use case diagram for 'Library management system'.

e) Draw component and deployment diagram for E-mail system.

Q4) Attempt any four of the following: **[4 × 4 = 16]**

a) Write short note on integration testing.

b) Discuss the Data Management Component.

c) What are the benifits of lterative development.

d) Draw a collaboration diagram for E-Purchasing.

e) A Cassette player has on/off, stop/eject, play rewind and fast forward buttons. The first 2 buttons allow toggling between the two states. Prepare a list of states events and activities and draw the state diagram.

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Total No. of Questions : 4]

P682

SEAT No. : ____

[Total No. of Pages : 3

[4239] - 13

M.Sc.

COMPUTER SCIENCE

CS-103 : Distributed Database Concepts

(2008 Pattern) (Semester - I)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Make necessary assumptions.***

Q1) Answer the following: **[8 × 2 = 16]**

a) What is Fragmentation? Give its type.

b) Define Flat and Nested Transaction.

. c) What is reference model?

d) Define dirty read.

e) List the steps of query decomposition.

f) Define DDBMS.

g) What are different way in which lock management is done?

h) Define A phantom condition.

Q2) Attempt any four: **[4 × 5 = 20]**

a) Discuss the problem area of distributed database system.

b) Explain R* algorithm of distributed query optimization.

c) Write a short note on distributed dead lock detection.

d) What are LRM commands? Explain.

e) Explain ACID properties of transaction.

P.T.O

Q3) Attempt any four: **[4 × 6 = 24]**

a) Consider the following relations.

ASG (eno, PNO, responsibility, duration)

PROJ(Pno, Pname, budget, loc)

Assume that relation PROJ is horizontally Fragmented as

PROJ1 = σ PNO < "P2"(PROJ)

PROJ2 = σ PNO < "P2"(PROJ)

and that relation ASG is horizontally fragmented as

ASG1 = σ PNO < "P2" (ASG)

ASG2 = σ "P2" < PNO<"P3" (ASG)

ASG3 = σ PNO > "P3" (ASG)

Transform the following query into a reduced query on fragments.

Select responsibility, budget

from ASG, PROJ

where ASG. PNO = PROJ. Pno

and Pname = "Dot NET".

b) Let objects X and Y be stored at site 1 and objects Z and W be stored at site 2. Determine for each of the following executions, wheather the execution is serializable or not. If the answer is affirmative, determine all possible total orders of transactions.

i) S1 : Ri(X), Rj(X), Wi(X), Wj(Y)
   S2 : Ri(Z), Rj(Z), Wj(Z), Wi(W)

ii) S1 : Ri(Y), Rj(X), Wj(X)
   S2 : Wi(Z), Rj(W), Wj(W)

c) Simplify the following query and transform it into an optimized operator tree using the restructuring algorithm.

Select ename, Pname

From emp, asg, proj

where asg.dur> 12 and

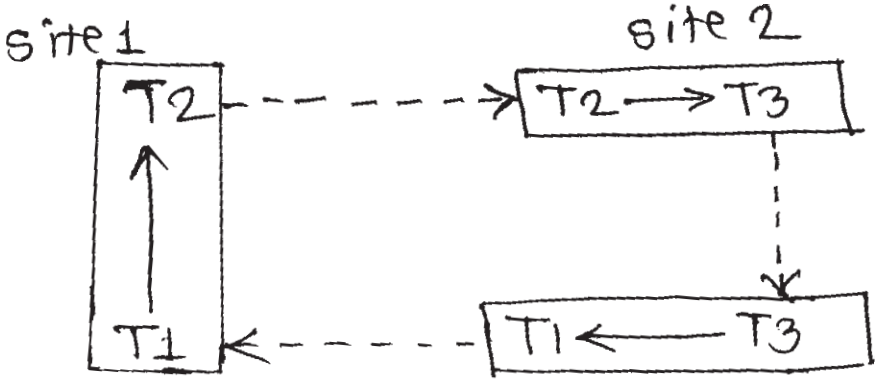
emp.eno = asg.eno and

(emp.title = " Mechanical Eng"

or asg.PNO<"P3") and

asg. PNO = Proj. PNO

d) Consider the DWFG given below.



Detect the deadlock using the distributed deadlock detection algorithm.

e) Draw the query graph and join graph for the following query.

Select ename, resp

From employee, asg, Proj

Where employee.eno=asg.eno

and Asg.PNO = Proj. Pno

and Pname = "Quality Mgmt."

and dur $\geq$ 12.

Q4) Attempt any four: **[4 × 5 = 20]**

a) What are timestamp based concurrency control algorithm? Explain any two algorithm.

b) Draw and explain layers of query processing.

c) Write a short note on lazy replication protocols.

d) What is check pointing? Explain the steps to achieve the check pointing.

e) Explain In place update Recovery and Out place update Recovery.

Total No. of Questions : 4]

P683

SEAT No. : ____

[Total No. of Pages : 4

[4239] - 14

M.Sc.

COMPUTER SCIENCE

CS11-104 : Design and Analysis of Algorithms

(2008 Pattern) (Semester - I)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) Attempt all of the following: **[8 × 2 = 16]**

a) What is best case & worst case running time for quick sort?

b) Write a greedy method control abstraction for the subset paradigm.

. c) What is a negative weighted cycle? How does it affect shortest path calculation.

d) What is longest common subsequence problem?

e) Define P & NP class of problems.

f) Find n_o such that for all $n>n_o$ the following is true $3\log_2 n < 4n < n^2$

g) What is a cut of flow network?

h) What is Hamiltanion cycles?

Q2) Attempt any four of the following: **[4 × 5 = 20]**

a) Given a sorted array of n numbers containing all but one of integers in the range 1 through n+1. Devise a divide and conquer based algorithm that determines the missing number.

b) Why quick sort is also called as partition and exchange sort? Derive its best case and worst case running time.

P.T.O.

c) Consider the following instance for job scheduling with deadlines problems where n=7

$(p_1, p_2.....p_7) = (6, 13, 20, 15, 6, 8, 33)$

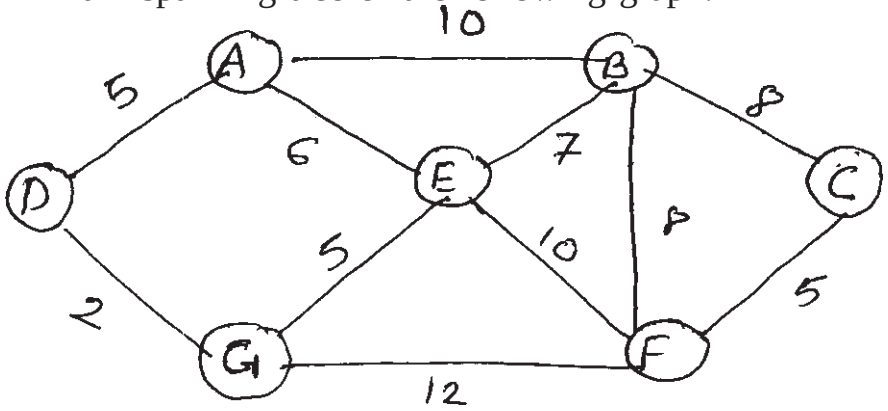
$(d_1, d_2.....d_7) = (2, 1, 4, 3, 2, 1, 2)$

Give solution obtained using fast greedy method that uses set representation.

d) Obtain the reduced cost matrix for the TSP instance defined by the cost matrix using dynamic programming.

$$\begin{bmatrix} \infty & 7 & 3 & 12 & 8 \\ 3 & \infty & 6 & 14 & 9 \\ 5 & 8 & \infty & 6 & 18 \\ 9 & 3 & 5 & \infty & 11 \\ 18 & 14 & 9 & 8 & \infty \end{bmatrix}$$

e) What is minimum spanning tree? Using prim's algorithm. Find the minimum spanning tree of the following graph.



Q3) Attempt any four of the following: **[4 × 5 = 20]**

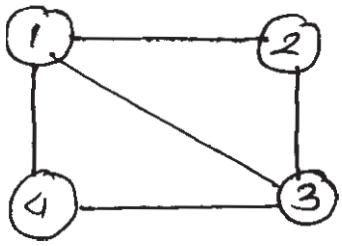
a) What are the minimum and maximum number of elements in a heap of height h? Is an sorted array a min heap? Justify.

b) What do you mean by prefix code? What is an optimal Huffman code for the following set of frequencies.

a	b	c	d	e	f	g	h
35	10	7	9	15	6	2	25

c) What is the best way to multiply a chain of matrices with dimensions that are 3×4, 4×5, 5×3, 3×6, using dynamic programming method.

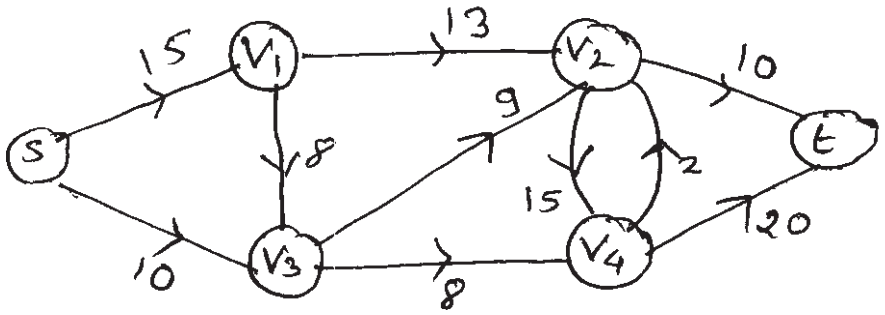
d) Find all Hamiltonian cycles for the following graph.



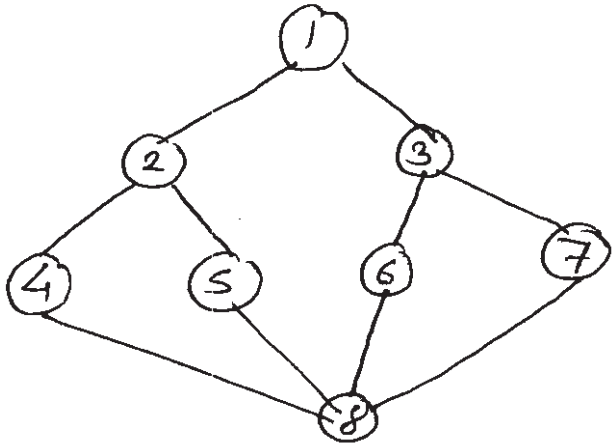
e) Write a non-deterministic algorithm for kanpsack problem.

Q4) Attempt any four of the following: **[4 × 6 = 24]**

a) What is flow network? Explain Ford Fulkerson algorithm to find maximum. Flow and illustrate it on the following network where s is the source and t is the sink.



b) Give BFS and DFS for the following graph show all steps



c) Consider 0/1 knap sack problem with n=3, w=(2, 3, 4) and p=(5, 6, 8) using dynamic programming devise the recurrence relation for the problem and solve it. Determine the optimal profit for the knapsack capacity 7.

d) Describe LCBB method apply it to solve following instance of 0/1 knapsack problem n=5

w = (4, 6, 3, 4, 2)

p = (10, 15, 6, 8, 4), m = 22

e) Explain 4 Queen's problem? Give the algorithm to solve 4 queen's problem using back tracking method. What is its time complexity.

f) Give the recurrence relation for the value of the optimal solution when lognest common subsequence problem is to be solved using dynamic programming method . Give the matrix of the values computed while determining LCS of the following string

X = abaabbab

Y = bababa

✡✡✡✡

Total No. of Questions : 5]

P684

SEAT No. :

[Total No. of Pages : 3

[4239] - 21

M.Sc.

COMPUTER SCIENCE

CS-201 : Advanced Networking Concepts

(2008 Pattern) (Semester - II)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Answer the following questions in two or three lines. **[8 × 2 = 16]**

Attempt all.

a) What is AAL? In which protocol it is used? Specify the layer.

b) State unix commands used to monitor the network traffic.

. c) What is difference between substitution cipher and transposition cipher?

d) What are multiple timers used by TCP?

e) Why does RTP need the service of another protocol RTCP but TCP does not?

f) What is role of relay agent? In which protocol it is used?

g) Justify true/ false.

The physical addresses change from hop to hop but logical addresses usually remain same.

h) A host with IP address 137.23.26.23/16 sends a packet to a host with IP address 142.3.6.9/24. Is delivery direct or indirect? Assume no subnetting.

P.T.O

Q2) Attempt any four of the following. **[4 × 4 = 16]**

a) Explain SNMP protocol in detail.

b) Silly window syndrome & clark's solution are complementary with each other justify.

c) How command processing is done in FTP? What are various types of commands? List some command in each type.

d) Explain various UDP applications.

e) Explain the characters used in TELNET by client to control the remote server.

Q3) Attempt any four of the following **[4 × 4 = 16]**

a) Discuss three strategies devised by IETF to help the transition from IPv4 to IPv6.

b) Explain in detail various forwarding techniques.

c) Explain the socket interface for connectionless concurrent servers.

d) Explain three phases that a mobile host goes through to communicate with a remote host.

e) Explain SNMP messages in detail.

Q4) Attempt any four of the following. **[4 × 4 = 16]**

a) A router running RIP has a routing table with 20 entries. How many periodic timers are needed to handle this table? How many expiration timers are needed to handle this table? How many garbage collection timers are needed to handle this table if five routers are invalid?

b) In transport protocols, Explain how connections are managed while they are in use.

c) Explain various options used by DHCP.

d) Explain the significance of link state update packet. Why it is called the heart of OSPF operation.

e) Explain various techniques used in point to point WAN to establish connection between two devices.

Q5) Attempt any four of the following. **[4 × 4 = 16]**

a) What are types of BGP sessions? Explain types of packets used in BGP.

b) Explain TCP Transmission policy.

c) Can the calculated sending time, receiving time or round trip time have a negative value? Why or why not? Give example.

d) Give the difference between transport layer and Data link layer.

e) Explain all headers used in HTTP.

Total No. of Questions : 5]

SEAT No. : ____

P685

[Total No. of Pages : 2

[4239] - 22
M.Sc.
COMPUTER SCIENCE
CS-202 : Unix Internals
(2008 Pattern) (Semester - II)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) Attempt all the following. **[8 × 2 = 16]**

a) Give any two services provided by the kernel.

b) Give the differences and similarities between the intrupt and exception.

. c) Draw and explain the structure of file system.

d) What is the use of trap instruction and who invoke this command?

e) How the kernel solves 'mutual exclusion problem'?

f) How the kernel determines whether an inode is free and a block is free?

g) Which are the different I/O parameters saved in V-area?

h) Write the formula to calculate priority of process.

Q2) State whether the following statements are true or false. Justify your answer. (any four) **[4 × 4 = 16]**

a) "The algorithm iget & iput do not require the process execution level to be raised to block out intrupts".

b) "Process θ and process 1 are the only processes not created by fork( )."

c) "Pipes allow synchronization of process execution".

d) "Kernel never invokes 'growreg' to increase the size of shared region."

e) "Processes may call exit( ) explicitly or implicitly at the end of program."

P.T.O

Q3) Attempt any four of the following. **[4 × 4 = 16]**

a) Which are the different data structures that are updated when we open a file?

b) Suppose the kernel does a delayed write of a block. What happens when another process takes that block from its Hash Queue?

c) Explain how the kernel handles inode which is a 'mount point'.

d) How to convert byte offset to block number in the file system?

e) Explain the concept of context of a process.

Q4) Attempt any four of the following. **[4 × 4 = 16]**

a) Draw a block diagram of the system kernel and explain it.

b) Write an algorithm which converts a pathname to an inode.

c) Write a program to print owner, file type and access permissions of a file supplied as command line argument.

d) Write a short note on layout of the kernel.

e) Explain the use of sticky bit and when the kernel removes sticky bit?

Q5) Attempt any four of the following. **[4 × 4 = 16]**

a) Which are the different fields in process table and U-area?

b) Explain process scheduling.

c) Explain Execve ( ) system call.

d) Write an algorithm to write a block to disk.

e) Explain Terminal Drivers.

Total No. of Questions : 5]

P686

SEAT No. : ____

[Total No. of Pages : 3

[4239] - 23

M.Sc.

COMPUTER SCIENCE

CS-203 : Software Architecture

(2008 Pattern) (Semester - II)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

Q1) Answer the following in two or three sentences. **[8 × 2 = 16]**

a) Name the phases in Unified Process.

b) Give two design patterns that help in decoupling of objects.

. c) Name component-and-connector type architectural structures.

d) Explain how 'Software Architecture manifests the earliest design decisions'.

e) What is the difference between tier and layer in terms of architecture?

f) Name categories of 'Patterns'.

g) What is the basic solution given by the singletone design pattern?

h) Give participants of 'command and state' pattern.

Q2) Write short notes on (any four). **[4 × 4 = 16]**

a) Module based Architectural structures.

b) Transition phase.

c) Sequence diagram.

d) Pipe and filters architectural pattern.

e) Singleton design pattern.

P.T.O

Q3) Attempt any four of the following. **[4 × 4 = 16]**

a) A command queue is a queue for delaying the execution of commands, usually either in order of priority or on a first-in-first-out basis. They are often useful in synchronous applications, where a command executor may receive a new command while it is still performing a previous one, and so requires a means of tracking what the commands are, and in what order they must be performed. Which design pattern is appropriate for this system? Explain with block diagram.

b) Consider a data mining agent which has client server architecture. Two sorting algorithms, Bubble sort and Quick sort, are implemented and the client can select either of the algorithms. The client must be a light client.

Which design pattern is appropriate for this system? Explain with block diagram.

c) What are GRASP design patterns? Explain with example.

d) A trial version of software "Voice recognition on mobiles" is under development. In this different modules are being developed which are analyzing the input data/sample voice and outputting the recognized text. Which architectural pattern is appropriate for this system? Explain with block diagram.

e) We have a class which is using private resources at server. We need to use this class at client side for some of its functionalities.

Which design pattern is appropriate for this system?

Q4) Attempt any four of the following. **[4 × 4 = 16]**

a) Explain information expert design pattern with example.

b) Give structure and participants of observer design pattern.

c) Compare struts and MVC architecture.

d) Explain Abstract Factory design pattern with example.

e) Give structure and participants of decorator design pattern.

Q5) Attempt <u>any four</u> of the following. **[4 × 4 = 16]**

a) Explain struts framework in brief.

b) Explain heterogeneous architecture in brief.

c) Explain in brief component based development.

d) Explain how 'Design patterns help to solve system designing problems'.

e) Explain interpreters in brief.

Total No. of Questions : 5]

SEAT No. : ____

P687

[Total No. of Pages : 2

[4239] - 31
M.Sc.
COMPUTER SCIENCE
CS-301 : Software Metrics and Project Management
(2008 Pattern) (Semester - III)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt the following **[8 × 2 = 16]**

a) List the qualities required for project manager.

b) State the purpose of statement of work.

. c) Define :

i) Availability

ii) Reliability growth problem

d) Define Activity-on-Arrow. State its use in project management.

e) What is earned value analysis?

f) What is CMM?

g) Give any four different aspects of size in measuring internal product attributes of software metrics.

h) Define :

i) Key Deliverables

ii) Summary Budget.

Q2) Attempt any four of the following **[4 × 4 = 16]**

a) Define project management? Explain the advantages of project management.

b) Explain the 'where and when' of metrics plan.

c) Explain in brief reliability growth problem.

d) Write a note on cost estimation tools and techniques.

e) Describe the project selection process.

P.T.O

Q3) Attempt any four of the following **[4 × 4 = 16]**

a) Explain the tools of activity sequencing in schedule management.

b) What are the three main categories of outputs of quality control?

c) Explain the tools and techniques required for risk quantification process

d) What are the main types of contracts if you decide to outsource?

e) Differentiate between software reliability and hardware reliability.

Q4) Attempt any four of the following **[4 × 4 = 16]**

a) What are the contents of overview of the project?

b) Write a short note on GQM paradigm.

c) Write a short note on WBS? How it is useful for project manager?

d) What are various methods of improving project communication? Explain any two in detail.

e) What is resource loading and resource leveling?

Q5) Attempt any four of the following **[4 × 4 = 16]**

a) Explain McCall's software quality model in detail.

b) Explain project life cycle.

c) Write a short note on overall change control?

d) How do we measure productivity? How does team structure affects productivity?

e) Explain with example how Gantt chart is useful for project manager.

Total No. of Questions : 5]

P688

SEAT No. :

[Total No. of Pages : 2

[4239] - 32

M.Sc.

COMPUTER SCIENCE

CS-302 : Mobile Computing

(2008 Pattern) (Semester - III)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) Attempt All of the following : **[16]**

a) How can MACA still fail in case of hidden/exposed terminals?

b) What is the difference between CDC and CLDC?

. c) What are the limitations of CDMA?

d) What is variable timing advance? Which problem this technique resolves in GSM?

e) What are the advantages of FHSS over DSSS?

f) What is profile? Name different profiles of J2ME.

g) What is Rover?

h) Compare HLR with VLR.

Q2) Attempt any Four of the following **[16]**

a) What are the advantages and disadvantages of cellular system.

b) What are the advantages of IPV6 in mobile IP?

c) Explain architecture of MMS.

d) Explain WTLS of WAP

e) What are the quality of services (QOS) does GPRS supports?

P.T.O

Q3) Attempt any Four of the following **[16]**

a) What is reverse tunneling? Why it is needed?

b) Compare proactive protocols and reactive protocols.

c) Explain agent discovery mechanism of mobile IP.

d) Why, typically, is digital modulation not enough for radio transmission?

e) Compare TDMA and CDMA

Q4) Attempt any Four of the following **[16]**

a) What are the features of WML?

b) What is the architecture of J2ME?

c) What is the reaction of standard TCP in case of packet loss? Why is it quite often problematic in the case of wireless networks and mobility?

d) Name the requirements for mobile IP and justify them.

e) Explain architecture of WAP.

Q5) Attempt any Four of the following **[16]**

a) Explain architecture of GSM.

b) How and why does I-TCP isolate problems on the wireless link? What are the main drawbacks of this solution?

c) Why are special protocols for the support of micro-mobility on the network layer needed?

d) Compare Text Box control and Text field control.

e) What are the different types of commands does J2ME supports?

Total No. of Questions : 5]

SEAT No. : ____

P689

[Total No. of Pages : 2

[4239] - 33
M.Sc.
COMPUTER SCIENCE
CS-303 : Information Systems Security
(2008 Pattern) (Semester - III)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Attempt all of the following : **[8 × 2 = 16]**

a) How polyalphabetic substitution cipher works?

b) Define i) Security Mechanism.

ii) Packet Spoofing.

. c) What is roaming certificates?

d) What would be the transformation of a message using Rail Fence technique. “This cipher has been broken many times & yet it has been used extensively”.

e) What is key wrapping?

f) Distinguish between Active & Passive attack.

g) What is Honey Pot?

h) Write any four requirements of a message digest.

Q2) Attempt any four of the following: **[4 × 4 = 16]**

a) Discuss X.800 security mechanisms.

b) Explain purchase request transaction supported by SET.

c) Apply play fair cipher on plaintext “University of Pune” & use keyword as “ attitude”.

d) Explain the broad level steps in PEM.

e) How DSA is used for digital signatures?

P.T.O

Q3) Attempt any four of the following: **[4 × 4 = 16]**

a) Explain the buffer overflow attack on SSL.

b) What are the common causes for revoking a digital certificate?

c) Explain the working of MD5.

d) Given two prime numbers P=17 & Q=19, find out N, E & D in an RSA encryption process.

e) Explain cipher block chaining mode's encryption & decryption process.

Q4) Attempt any four of the following **[4 × 4 = 16]**

a) Discuss the relationship of strength of cryptographic key with key size.

b) List the authentication tokens types. Describe any one in detail.

c) Consider the plaintext "University of Pune" one time pad is QACDZMOUXGIJNVBP using vernam cipher construct the cipher text.

d) Explain the working & disadvantages of HMAC.

e) Explain the ESP's mode of operation.

Q5) Attempt any four of the following: **[4 × 4 = 16]**

a) Explain the method by which we can avoid replay attack in user authentication.

b) What is firewall? Explain the limitations of Firewall.

c) Discuss subkeys generation process of blowfish algorithm.

d) What are the typical contents of a digital certificate?

e) Discuss the working of 3-D secure protocol.

Total No. of Questions : 5]

SEAT No. :

P690

[Total No. of Pages : 4

[4239] - 101
M.Sc.
COMPUTER SCIENCE
CS-101 : Principles of Programming Languages
(2011 Pattern) (Semester - I)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

Q1) Attempt any eight **[8 × 2 = 16]**

a) List any 2 functions of 'C' preprocessor.

b) Give use of following equality predicates of LISP

i) EQ

ii) =

. c) What is an anonymous variable in Prolog? Give its significance when used in a clause.

d) What is parametric polymorphism and subtype polymorphism?

e) What is an iterator? Name any 2 languages supporting iterators.

f) Define -

i) Fully qualified references

ii) Elliptical references.

g) List two design issues specific to functions.

h) What is the fragile base class problem?

i) What are heterogeneous arrays? List any 2 languages supporting it.

j) What kind of Java Object is a monitor?

P.T.O

Q2) Attempt any four **[4 × 4 = 16]**

a) Explain the programming language spectrum.

b) Consider the following pseudocode:

```
x : integer  -- global
procedure set_x(n : integer)
    x : = n
procedure print-x
write_integer(x)
procedure first
    set_x(1)
    print_x
procedure second
    x : integer
    set_x(2)
    print_x
set_x(0)
first( )
print_x
second( )
print_x
```

What does this program print if the language uses static scoping? What does it print with dynamic scoping? Why?

c) What is short circuited evaluation? Give advantages of short-circuited evaluation.

d) What is dangling pointer? Give sequence of operations that creates a dangling pointer in many languages.

e) Explain the difference between initialization and assignment in C++ with suitable example.

Q3) Attempt any four **[4 × 4 = 16]**

a) Describe the logical architecture of an MIMD computer. What level of program concurrency is best supported by MIMD computer?

b) Explain concept of tail recursion with suitable example.

c) Explain various categories of arrays based on binding to storage.

d) Explain the two step process for accessing non local variables in a static scoped language with nested subprogram.

e) Give implementation of virtual methods for the following:

```
class bar
{
  int a;
 double b;
 char c;
 public;
      virtual void x(--) {---}
      virtual void y (--) {---}
      virtual void z (--) {---}
      virtual void m ( );
} F
```

Q4) Attempt any four **[4 × 4 = 16]**

a) What is garbage? What are different approaches to garbage collection?

b) What is monitor? What advantages do monitors have over semaphores?

c) Explain any four parameter passing modes with suitable examples.

d) What is task? Give 3 characteristics of tasks that distinguish it from a subprogram.

e) Explain different times at which binding decisions can be made.

Q5) Attempt any four **[4 × 4 = 16]**

a) Define a recursive function in lisp to return last element of the list.

b) Consider the following sentences : “Marcus was a man. Marcus was a pompeian. All pompeians were roman. Caeser was a ruler. All romans hated all rulers. Marcus tried to assassinate caeser”. Write a Prolog program to prove that marcus hate caeser and show how it will be proved by your program.

c) Write a prolog program for finding GCD of two numbers.

d) Write a lisp function to find union of two lists.

e) “If A is on top of B, B supports A. If A is above B and they are touching each other, A is on top of B. Class is above a table glass is touching a table”. Write a prolog program to prove that table supports glass.

✡✡✡✡

Total No. of Questions : 5]

P691

SEAT No. : ____

[Total No. of Pages : 3

[4239] - 102

M.Sc.

COMPUTER SCIENCE

CS-102 : Advanced Networking

(2011 Pattern) (Semester - I)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt all of the following: **[8 × 2 = 16]**

a) An IP datagram arrives with fragmentation offset O & an M bit of O, Is this a first fragment, middle fragment, or last fragment?

b) Define temporal masking.

. c) How router forwards the datagram based on host specific method.

d) List all SET participants.

e) What is the principle behind one time pads? Why they are highly secure?

f) In the standard ethernet, if the maximum propogation time is 25.6μs., what is the minimum size of frame?

g) List the major dissimilarities in transport protocol & data link protocol.

h) What is use of IV in CBC mode?

Q2) Attempt any four of the following: **[4 × 4 = 16]**

a) Explain the design goals of ATM.

b) What is the use of option field in IPv4? Explain any two multiple byte options.

c) Alice meets Bob & says zewfidrkzfe jpjkvdj jvtlizkp. If she is using modified version of caesar cipher, what does she want to convey?

P.T.O

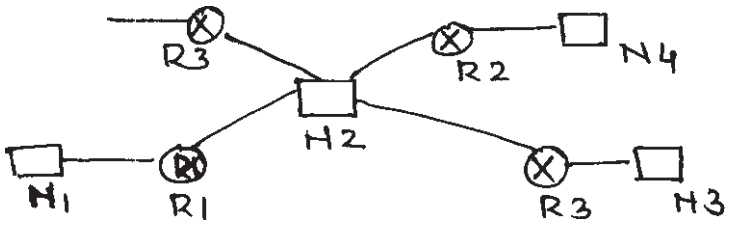
d) Nagle's algorithm & clark's solution to the silly window syndrome are complementary to each other. Comment.

e) How does certificate based authentication work?

Q3) Attempt any four of the following : **[4 × 4 = 16]**

a) Which protocols are used in IPsec? Why they are required?

b)



In the fig. show which router(s) sends out router link & network link LSAs?

c) Discuss double DES? What is the idea behind meet in the middle attack.

d) Why digital certificate revocation is needed? How offline certificate revocation status check is done?

e) What are the problems for full implementation of voice over IP? Do you think we will stop using the telephone network very soon?

Q4) Attempt any four of the following: **[4 × 4 = 16]**

a) Discuss various attacks on IP packet.

b) Explain how TCP handles window management?

c) What is multicast routing? Explain source-based tree approach for calculating shortest path tree.

d) What is buffer overflow? List any four buffer overflow vulnerabilities in the SSL handshakes.

e) Given two prime numbers P=19 & Q=7. Find out N,E & D in an RSA encryption process.

Q5) Attempt any four of the following: **[4 × 4 = 16]**

a) Explain how SET protocol protects credit card transaction on the Internet?

b) Discuss the various techniques which may be used by transport entity for restricting packet lifetime.

c) Explain the fragmentation process of IPv4 datagram.

d) How Bellman-Ford algorithm is used to find shortest path?

e) What is VPH? Explain its architecture.

Total No. of Questions : 5]

SEAT No. :

P693

[Total No. of Pages : 4

[4239] - 104

M.Sc.

COMPUTER SCIENCE

CS-104 : Design and Analysis of Algorithms

(2011 Pattern) (Semester - I)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

Q1) Attempt any eight from the following **[8 × 2 = 16]**

a) Define O notation IS $O(n!) = O(n^m)$. Justify

b) Give the control abstraction for divide and conqueror strategy.

. c) Huffman code is fixed length code? Justify

d) Define principle of optimality? State one essential difference between greedy method and dynamic programming.

e) Give the bounding function for sum of subset problem.

f) What do you mean by branch and bound? Give an eg. of an application where this technique might be useful.

g) What are strengly connected components?

h) What is satisfiability problem? State cook's theorem.

i) Define Horner's rule?

j) What are the limitations of Merge-sort?

Q2) Attempt any four of the following **[4 × 4 = 16]**

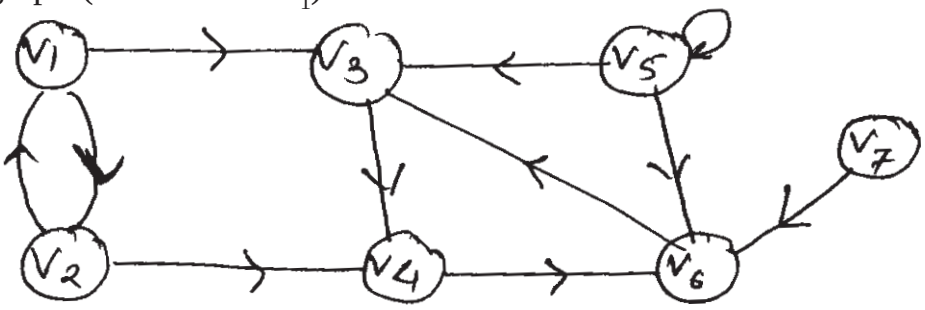
a) Explain strassen's matrix multiplication. Derive the time complexity required by strassen's matrix multiplication.

P.T.O

b) Find the optimal solution for the following 0/1 knapsack problem by jump and point method.

n = 3, m = 6, w = (2, 3, 4), p = (1, 2, 5)

c) Illustrate the strongly connected components algorithm on the following graph (start vertex V_1)



d) Find the minimum cost of computing product of chain of matrices having dimension 20×5, 5×10, 10×10, 10×5 using dynamic programming.

e) Let p_1, p_2,....p_n be n programs to be sorted on a disk program pi requires Si kilobytes & the capacity of the disk is D kilobytes where

$$D < \sum_{i=1}^{n} s_i$$

Give the separate greedy algorithm for the following objective function.

i) To maximize number of programs held on the disk

ii) To use as much capacity of the disk as possible

Q3) Attempt any four of the following **[4 × 4 = 16]**

a) Order the following functions in ascending order of their growth rates and justify

e^n, n^n, n^2, 4^2, $\log 3^n$, logn, n!

b) Write a non-deterministic algorithm to solve knapsack problem.

c) Given set S of weight as {12, 15, 18, 5, 20} n=5, m=50. Apply Backtracking algorithm to find all possible subsets of s that give the sum of element 50.

d) Draw the portion of state space tree generated by LCBB for the knapsack problem with variable tuple where

w = (2, 4, 6, 9), p = (10, 10, 12 18)

n = 4, m = 15

e) Write an algorithm to find fast fourior transform using divide and conquer strategy.

Q4) Attempt any two of the following **[2 × 8 = 16]**

a) Given a sorted array of n numbers containing all but one of integers in the range 1 through n+1. Devise a divide and conquer based algorithm that determines the missing number. Derive the time complexity required for this algorithm.

b) A string X can be transformed into a string Y by applying a sequence of edit operations such as insert, delete & interchange with associated costs of 1, 1, & 2 respectively. Give the recurrence relation for the value of the optimal solution when the problem is to be solved using Dynamic programming for

X = 1, 1, 0, 1, 1, 0, 1, 0, 1, 1 &

Y = 0, 1, 0, 1, 1, 0, 1, 0, 0

Give the matrix of the values computed in bottom up manner.

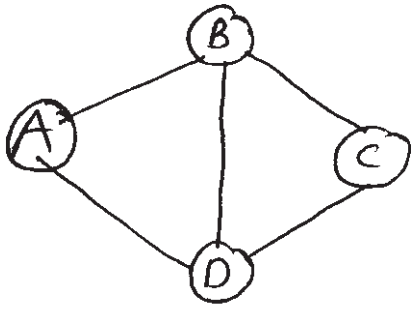
c) What is knapsack problem? Justify that all optimal solutions will fill the knapsack capacity exactly. Find optimal solution to the knapsack instant using greedy method. m=6, m=25

$(p_1, p_2, ...p_7) = (16, 17, 8, 3, 3, 9, 8)$

$(w_1, w_2 ....w_7) = (16, 4, 4, 5, 8, 3, 3)$

Q5) Attempt any two of the following. **[2 × 8 = 16]**

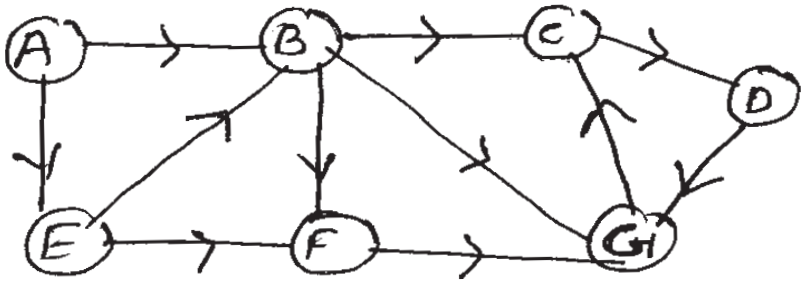
a) What is m-colorability of graph problem. Give the formulation of implicit and explicit constraints in case of m-colorability graph problem with n-nodes? Find all possible solutions for 3-coloring of a following graph.



b) Why bounding function are useful in the context of branch and bound. Consider the travelling saleman instance defined by the following cost matrix. Obtain reduced cost matrix using LCBB.

$$\begin{bmatrix} \infty & 11 & 10 & 9 & 6 \\ 8 & \infty & 7 & 3 & 4 \\ 8 & 4 & \infty & 4 & 8 \\ 11 & 10 & 5 & \infty & 5 \\ 6 & 9 & 5 & 5 & \infty \end{bmatrix}$$

c) Define BFS and DFS? Illustrate it on the following graph.



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Total No. of Questions : 8]

P694

SEAT No. : ____

[Total No. of Pages : 3

[4239] - 201

M.Sc.

COMPUTER SCIENCE

CS-201 : Digital Image Processing

(2011 Pattern) (Semester - II)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any four from the remaining***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) Attempt all **[8 × 2 = 16]**

a) Name any two applications where image acquisition is done using sensor strips.

b) Give co-ordinates of $N_4(P)$ and $N_D(P)$ if point 'P' is at (50, 50) position.

. c) How much time is required for transmitting a 1024 × 1024 image with 256 intensity levels if the modem used has a speed of 8192 bps?

d) Give any two methods for generating signatures.

e) Which of the following images will need higher sampling rate? why?

(i)  (ii) 

f) If the following mask is used for line detection, which orientation of lines will it detect? why?

–1	2	–1
–1	2	–1
–1	2	–1

g) Define reflection and translation operations on a set 'B'.

h) Find city-block and chess-board distance between points P(25, 25) and q(30, 35)

P.T.O

Q2) a) Explain the role of different components of a general purpose digital image processing system. **[8]**

b) Draw a contrast stretching function and explain its operation in image enhancement. **[4]**

c) Define mixed adjacency. Explain how it eliminates ambiguity that often arises with 8-adjacency. **[4]**

Q3) a) Explain the role of image sampling and quantization in forming a digital image. **[8]**

b) Write equations for obtaining 2D forward and inverse DFT. Give the meaning of each variable in the equations. **[4]**

c) One dimensional image strip represented by {1 2 5 9 4 3} is to be convolved with a filter kernel given by { –1 0 1}. Give the step-by-step procedure of finding the answer. **[4]**

Q4) a) A 32 × 32 pixel image has intensity distribution as shown in the table given below. The intensity levels are in the range 0-7. Apply histogram equalization technique and find the transfer function that relates output image intensity level S_k with input image intensity level V_k. **[8]**

Intensity Level	No. of pixels
$V_0 = 0$	211
$V_1 = 1$	344
$V_2 = 2$	103
$V_3 = 3$	127
$V_4 = 4$	76
$V_5 = 5$	57
$V_6 = 6$	47
$V_7 = 7$	59

b) Explain low pass filtering in frequency domain. **[4]**

c) What is bit plane slicing? Mention any one of its applications. **[4]**

Q5) a) Define a linear operation. Find out whether 'maximum' operator which finds the maximum pixel value in a given image is linear or not. Take suitable example for illustration. **[8]**

b) Explain the model for image degradation and restoration. **[4]**

c) What are 'max' and 'min' filters? Which type of noise do they reduce and how? **[4]**

Q6) a) State convolution theorem and give steps for filtering in frequency domain. **[8]**

b) Illustrate the use of chain codes. **[4]**

c) Describe different ways of estimating degradation function. **[4]**

Q7) a) What is the use of 'Hit-or-Miss' transform? Explain its use with help of suitable diagrams and defination. **[8]**

b) Sketch different edge models and write three steps in edge detection. **[4]**

c) Explain how we can reduce a periodic noise with a notch filter. **[4]**

Q8) a) Describe fundamental steps in digital image processing. **[8]**

b) Write a short note on boundary approximation using 'mpp' **[4]**

c) Define 'erosion' and explain it using suitable diagrams. **[4]**

Total No. of Questions : 5]

SEAT No. :

P695

[Total No. of Pages : 4

[4239] - 202
M.Sc.
COMPUTER SCIENCE
CS-202 : Advanced Operating Systems
(2011 Pattern) (Semester - II)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) Attempt all the following: **[8 × 2 = 16]**

a) Explain copy-on-write command.

b) Explain the structure of priority array.

. c) Explain I/O bound versus processor-bound processes.

d) Write any four scheduler-related system calls.

e) Write any four inode-operations.

f) Write any two thread functions.

g) Describe create process, Terminating process.

h) Write four basic types of user-mode processes in windows.

Q2) Justify the following(any eight) **[8 × 2 = 16]**

a) “Process θ and process 1 exists throughout the lifetime of a system.”

b) “getuid ( ) & setuid ( ) functions are available in signal.h file.”

c) “Processes can exercise crude control of their scheduling priority by using nice ( ) system call.”

d) “Each process group can have multiple process group leaders”

e) “The kill function sends a signal to a process or a group of processes, but not it self”

f) “SIGALRM” signal is generated when a timer expires.

P.T.O

g) Sig1 & Sig 2 are user defined signals.

h) " 'Terminated by a signal' is abnornal termination".

i) Kernel keeps the inode locked across the execution of system calls.

j) At the kernel level, support for protected process is two fold.

Q3) Attempt <u>any four</u> of the following **[4 × 4 = 16]**

a) Explain fork ( ) & vfork ( ) system calls.

b) How Linux handles a system call.

c) Explain a process of implementation of intrupt handling in Linux.

d) Explain atexit ( ) function.

e) Draw windows architecture.

Q4) Explain the behaviour of following 'C' programs (any four) **[4 × 4 = 16]**

a)

```
# include <fcntl.h>
main ( )
{
int uid, euid, fdmjb, fdmaury;
uid=getuid ( );
euid=geteuid ( );
printf("uid=%d euid=%d", uid, euid);
fdmjb=open("mjb",O-RDONLY);
fdmaury=open("maury",O-RDONLY);
printf("fdmjb=%d fdmaury=%d", fdmjb, fdmaury);
setuid(uid);
printf("after setuid(%d):uid=%d euid=%d\n", uid, getuid ( ), geteuid ( ) );
set uid(euid);
printf("after setuid(%d):uid=%d euid=%d \n", euid, getuid ( ), get euid ( ) );
}
```

b)
```
main ( )
{
    int status;
    if(fork ( ) = = 0)
        execl("/bin/date", "date", θ);
    wait(&status);
}
```

c)
```
# include <signal.h>
main ( )
{
    extern catcher ( ) ;
    signal(sigINT, catcher);
    kill(θ, SIGINT);
}
catcher ( )
{
}
```

d)
```
main ( )
{
    int fd1, fd2;
    char buf1[512], buf2[1024];
    fd1=fopen("/etc/passwd",O-RDONLY);
    fd2=fopen("/etc/passwd",O-RDONLY);
    read(fd1, buf1,sizeof(buf1));
    read(fd2,buf2,sizeof(buf2));
}
```

e)
```
# include<signal.h>
main(int argc,char *argv[ ])
{
char buf[256];
if(argc!=1)
        signal(SIGCLD, SIG-IGN);
while(read(o,buf,256))
        if(fork ( ) = = 0)
    exit(θ);
}
```

Q5) Write a C program for the following. (any four) **[4 × 4 = 16]**

a) Write a C program which opens a file & goes to sleep for 15 seconds before terminating.

b) Write a C program that copies its standard input to standard output.

c) Write a C program that prints the file size of a given file.

d) Write a C program that truncates files to zero length but does not change their access time or modification time.

e) Write a C program to print the type of file for each command-line argument.

Total No. of Questions : 5]

SEAT No. :

P696

[Total No. of Pages : 3

[4239] - 203

M.Sc.

COMPUTER SCIENCE

CS-203 : Data Mining and Data Warehousing

(2011 Pattern) (Semester - II)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following: **[8 × 2 = 16]**

a) What are the ways by which Data Mining algorithms are characterized?

b) Define : Summarization.

. c) Give any 2 applications of data mining.

d) Define : Meta data.

e) What are data mining metrics?

f) Define an association rule.

g) Define : frequent set.

h) What do you mean by machine learning?

i) List any 2 data mining tasks.

j) What is meant by pattern?

Q2) Attempt any four of the following **[4 × 4 = 16]**

a) Write a note on : Architecture of data warehouse.

b) Discuss the issues that has to be considered during data integration.

c) Give details on data mining versus knowledge discovery in database.

d) What do you mean by CART?

e) Explain : over fitting with an example.

P.T.O

Q3) Attempt any two of the following: **[2 × 8 = 16]**

a) Consider the following transaction table and generate the candidate itemsets and frequent itemsets, where the minimum support count is 2.

TID	List of Items
T_{100}	I_1, I_2, I_5
T_{200}	I_2, I_4
T_{300}	I_2, I_3
T_{400}	I_1, I_2, I_4
T_{500}	I_1, I_3
T_{600}	I_2, I_3
T_{700}	I_1, I_3
T_{800}	I_1, I_2, I_3, I_5
T_{900}	I_1, I_2, I_3

Apply Apriori Algorithm to find the candidate itemset and frequent item set.

b) Explain the terms related to data processing.

i) Data cleaning

ii) Boot strap

iii) Precision and Recall.

c) Construct an FP-Tree for the following data.

TID	Item
1	A, B, C
2	D, A, C, B
3	C, A, B
4	B, A, D
5	D
6	D, B
7	A, D, B
8	B, C

Q4) Attempt <u>any four</u> of the following **[4 × 4 = 16]**

a) Explain frequent item-set algorithm.

b) What do you understand by agglomerative and divisive hierarchical clustering? Give an example.

c) List and briefly explain the issues in classification.

d) Write a note on : Decision tree Induction with an example.

e) Suppose that a data ware house for Big University consists of the following four dimensions : Student, Course. Semester and Instructor, and two measure count and avg-grade. When the lower conceptual level (e.g for a given student, course and semester instructor combination), the avg-grade measure stores the actual course grade of the student. At higher conceptual levels, avg-grade stores the average grade for the given combination.

Draw a starflake diagram for the data ware house.

Q5) Attempt <u>any four</u> of the following **[4 × 4 = 16]**

a) Write a note on: web Taxonomy

b) Discuss the data mining issues (any 4)

c) Explain dimensional data modeling.

d) How prediction is used as an approach in Regression?

e) Write a note on : OLAP in multidimensional data model.

Total No. of Questions : 5]

P697

SEAT No. :

[Total No. of Pages : 2

[4239] - 301

M.Sc.

COMPUTER SCIENCE

CS-301 : Software Metrics and Project Management

(2011 Pattern) (Semester - III)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt the following questions: **[8 × 2 = 16]**

a) Explain development phase of project life cycle?

b) Define i) Software reliability ii) Productivity

. c) List the various types of cost estimates.

d) Define i) Measurement ii) Bug

e) What are the characteristics of mature process?

f) What is metric plan?

g) List the contents of risk register.

h) Define staff acquisition.

Q2) Attempt any four of the following: **[4 × 4 = 16]**

a) What is solicitation planning and explain solicitation in brief?

b) Explain any four activities involved in software measurement.

c) "The basic problem of reliability theory is to predict when a system will eventually fail" Justify.

d) How change control board used in IT projects.

e) What is project? Explain triple constraint on project.

P.T.O

Q3) Attempt any four of the following: **[4 × 4 = 16]**

a) Define project charter? Consider the example of designing a website for college management system. Design project charter for the above system.

b) How to use decision tree in risk management?

c) Write a short note on TSP.

d) Explain roles and responsibilities of measurement team.

e) Once the data has been collected in software metrics, how to analyze the data?

Q4) Attempt any four of the following: **[4 × 4 = 16]**

a) Write a short note on performance reporting.

b) Which factors affects the quality of IT project?

c) Describe Gantt Chart?

d) Explain overview of project in details.

e) Explain in detail project scope statement.

Q5) Attempt any four of the following: **[4 × 4 = 16]**

a) What are the different types of power in HR management.

b) Explain cocomo model.

c) Explain any two quality models.

d) Write a short note on cost budgeting

e) Write a short note on stakeholder analysis.

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Total No. of Questions : 5]

P698

SEAT No. :

[Total No. of Pages : 2

[4239] - 302

M.Sc.

COMPUTER SCIENCE

CS-302 : Mobile Computing

(2011 Pattern) (Semester - III)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt all of the following: **[8 × 2 = 16]**

a) Define multi path propagation.

b) What is encapsulation?

. c) What are the main benefits of spread spectrum system?

d) List any two advantages of I-TCP

e) Define the functionality of node B in UTRA.

f) Discuss near & far terminals.

g) List the problems related with reverse tunneling.

h) Explain the use of broadcast control channel.

Q2) Attempt any four of the following: **[4 × 4 = 16]**

a) Discuss various applications of mobile communication. .

b) Name the requirements for mobile IP & justify them. Does mobile IP fulfill them all?

c) Why & when are different signaling channels needed? What are the differences?

d) What is path loss of radio signal? Also explain additional signal propagation effects.

e) Explain WAP push architecture.

P.T.O

Q3) Attempt any four of the following **[4 × 4 = 16]**

a) Explain different types of handover used in UMTS.

b) Explain any one IP micro mobility protocol with its advantages & disadvantages.

c) Draw & explain GPRS transmission plane protocol model.

d) What is the reaction of standard TCP in case of packet loss? Why is it quite often problematic in the case of wireless network & mobility?

e) Explain the features of WSP/B adapted to web browsing.

Q4) Attempt any four of the following **[4 × 4 = 16]**

a) Explain J2ME architecture.

b) How does destination sequence distance vector routing handle routing.

c) Explain the mobile terminated SMS procedure.

d) Discuss the working of snooping TCP with its advantages & disadvantages.

e) Compare in between TDMA & FDMA.

Q5) Attempt any four of the following **[4 × 4 = 16]**

a) What could be quick solutions? Why don't they work of mobile IP

b) Discuss the LCS logical reference model.

c) Explain the UTRAN architecture.

d) List the features of Android.

e) Discuss the advantages & disadvantages of cellular system.