

Total No. of Questions :5]

SEAT No. :

P1753

[Total No. of Pages :2

[5133] - 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) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*

Q1) Attempt all of the following:

[8×2=16]

- a) What is bound and free variables in prolog.
- b) What is P-code? What is JIT compiler?
- c) What is Lazy evaluation?
- d) Differentiate between type casting and coercion.
- e) Define Precedence and Associativity.
- f) State any 2 datatype predicates in LISP with purpose.
- g) What is cactus stack?
- h) Define multithreading.

Q2) Attempt any four of the following:

[4×4=16]

- a) What is binding and binding time? Explain load time and link time bindings.
- b) What is short circuit evaluation? How it is useful?
- c) What is referencing environment? Describe the difference between deep and shallow binding of referencing environment.
- d) Define Exception. Explain with example in Java.
- e) What is dangling references? Explain how it is handled using tombstones.

P.T.O.

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

- a) What is display? How it is differ from static chain?
- b) What is subroutine calling sequence? What is does? What is the meaning of subroutine prologue and epilogue?
- c) Why there are so many programming languages?
- d) Differentiate between applicative and normal order evaluation.
- e) What is comformant array? What is a dope vector?

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

- a) Explain run-time polymorphism with example.
- b) Explain the implementation of multiple inheritance with the help of suitable example with diagram.
- c) State the difference between static scope and dynamic scope.
- d) Explain visibility rules in C++.
- e) discuss the significance of 'holes' in records. Why do they arise? What problem do they cause?

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

- a) Explain the process of unification.
- b) Give difference between CONS and APPEND in LISP.
- c) Write a recursive function in LISP to find maximum number from list.
- d) Write a LISP function to find whether a given symbol is a member of a given list.
- e) Explain the concept of dynamic database from prolog.

EEE

Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :2

P1754

[5133] - 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.*

Q1) Attempt all of the following:

[8×2=16]

- a) What is unified process?
- b) Define:
 - i) Fork
 - ii) Polymorphism
- c) What is Reverse Engineering.
- d) Define UML.
- e) What is Regression testing?
- f) Define Annotation Elements.
- g) What is Attribute.
- h) What are abstract classes.

Q2) Attempt any four of the following:

[4×4=16]

- a) Describe the components of use case diagram.
- b) What are the different types of relationships supported in UML.

P.T.O.

- c) Write a note on Raumbaugh method.
- d) Write a note on UML's extensibility mechanism.
- e) Distinguish between Aggregation & Generalization.

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

- a) Draw sequence & Activity Diagram for ATM machine.
- b) Draw component & Deployment Diagram for E-mail system.
- c) Draw a class diagram for "Hospital Management System".
- d) Prepare an object diagram showing at least six relationships among the following object classes. Include association, aggregation and generalization show multiplicity and add atleast one attribute to each class, card, desk, hand, collection of cards, discord file draw file.
- e) Draw state diagram & activity diagram for considering different scenarios for ice-cream (Flavoured) vending machine.

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

- a) Write a note on coad & Yourdan method.
- b) Write short note on integration testing.
- c) What are the benefits of Iterative Development.
- d) Draw a collaboration diagram for E-purchasing.
- e) Consider an automatic water level control system which is used for controlling the water flow. Identify the different states & draw a state transition diagram.

EEE

Total No. of Questions : 4]

SEAT No :

P1755

[5133]-13

[Total No. of Pages : 4

M.Sc.

COMPUTER SCIENCE

CS - 103 : Distributed Database Concepts

(2008 Pattern) (Semester-I)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

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

Q1) Answer the following:

[8 × 2 = 16]

- a) Define concept of serializability in a DBMS.
- b) What is global directory?
- c) Distribution of data increases availability comment.
- d) State the contents that are defined for update statements in the work load of a DBMS.
- e) Define the terms-MTBF & MTTR.
- f) Write any one method in R* algorithm.
- g) Define the following:
 - i) A disjunctive normal form (DNF) of a query qualification.
 - ii) A conjunctive normal form (CNF) of a query qualification.
- h) What is hybrid fragmentation.

P.T.O.

Q2) Attempt any four:

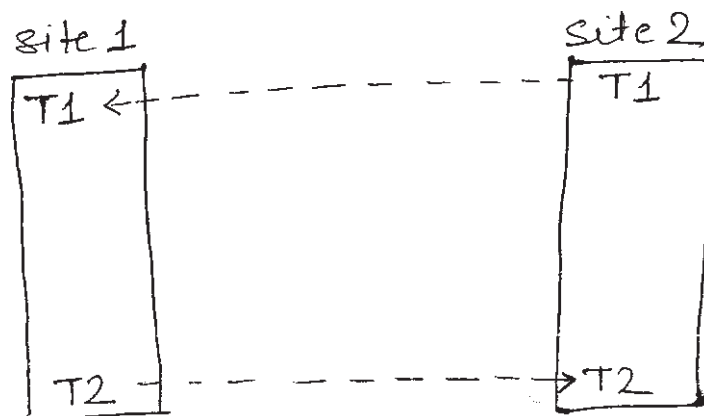
[4 × 5 = 20]

- What are different problem areas which are required to be handled by DBMS? Explain any one in detail.
- Explain different phases of query decomposition.
- Discuss on the criterias, based on which the correctness of a derived fragmentation is decided.
- Comment on following:
“The multilingual approach of implementing a MDBS architecture, makes querying easier from a user perspective”.
- Write a short note on distributed deadlock detection.

Q3) Attempt any four :

[4 × 6 = 24]

- Consider the DWFG given below. Detect the deadlock using the distributed deadlock detection algorithm.



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

Execution 1:

S1: Ri(X) Rj(X) Wj(Y) Wi(X)

S2: Ri(W) Rj(Z) Wj(W) Wi(W)

Execution 2:

S1: Ri(W) Rj(X) Wj(Y) Wi(Y)

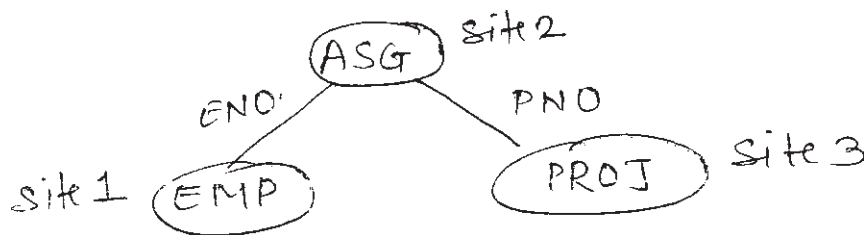
S2: Wi(Z)

Execution 3:

S1: Ri(X) Rj(X) Wi(X) Wj(Y)

S2: Ri(Z) Rj(Z) Wj(Z) Wi(W)

- c) Simplify the following query and transform it into an optimized operator tree, using the restructuring algorithm.
Select iname, Inv_no from itemI, Invoice In, It_inv itn where In.amt>5000 and itn.itno=I.itno(I.iname = 'grocery' OR itn.Qty = 100) and itn.Inv_no=In.Inv_no;
- d) Consider the following join graph.



Let size (emp)=100, size(ASG)=200, size(PROJ)=300, size(emp \bowtie ASG)=300, size(ASG \bowtie PROJ)=200

Assume that query needs to access all relation write all possible ways in which query can be executed along with minimum data transfer.

- e) Let $Q = \{q_1, q_2, q_3, q_4, q_5\}$ be the set of queries.
 $A = \{A1, A2, A3, A4, A5\}$ be the set of attributes.
 $S = \{S1, S2, S3\}$ be the set of sites.

Matrix(a) describes attribute usage values & Matrix(b) gives application access frequencies. Assume that $\text{ref}(q_k)=1 \forall q_k$ and S_i , and that A4 is the key attribute. Use Bond Energy and vertical partitioning algorithms to obtain vertical fragments of set of attributes in A.

Matrix (a)						Matrix(b)			
	A1	A2	A3	A4	A5		S1	S2	S3
q_1	0	1	1	1	0	q_1	20	4	0
q_2	1	1	1	0	0	q_2	25	10	0
q_3	1	1	0	0	0	q_3	15	0	0
q_4	0	0	0	1	1	q_4	0	0	30
q_5	0	0	1	1	1	q_5	0	20	25

Q4) Attempt any four :

[4 × 5 = 20]

- a) Discuss deadlock Avoidance scheme used in DDBMS?
- b) What is workflow? Explain the different types of workflow.
- c) Explain primary copy 2PL protocol and state its advantages & disadvantages.
- d) Explain how abort, commit and recover commands are handled in No-Fix | Flush algorithm.
- e) Discuss on the drawbacks of 2PC protocol, with special emphasis on blocking and reduction of message passing between co-ordinator and participant.

x x x

Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :3

P1756

[5133] - 14

M.Sc.

COMPUTER SCIENCE

CS-104: Design and Analysis of Algorithm

(2008 & 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) Define θ notation & show that $3n+2 = \theta(n)$.
- b) What is bounding function of sum of subset problem?
- c) Greedy strategy may not always yield optimal solution. Justify?
- d) Show that there is no solution to the 2-Queen's problem.
- e) Depth first search use backtracking technique. Justify T|F.
- f) Give the statement of Cook's theorem.
- g) What is cut of flow network?
- h) What is the implicit & explicit constraints of graph color algorithm.

Q2) Attempt any four of the following:

[4×5=20]

- a) Rank the following function in increasing order of their growth rates.

$n, 4^n, e^n, n^n \log e(n^n), n!. \log e(\log n)$

- b) Show that the running time of quick sort is $O(n^2)$. When the array A contains distinct elements & is sorted in decreasing order.

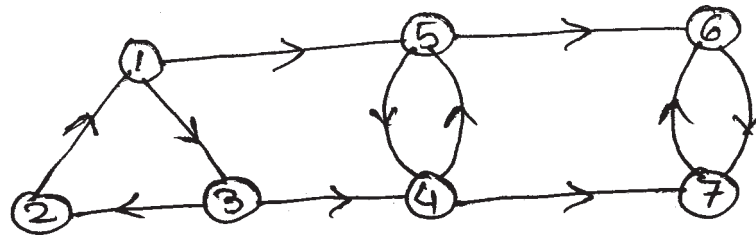
P.T.O.

- c) Obtain optimal solution for the following job sequencing with deadline using greedy method.
 $n = 5, p = (20, 10, 1, 15, 5)$
 $d = (2, 1, 3, 2, 3)$
- d) Explain longest common subsequence problem. Give the recurrence relation for the value of the optimal solution when the problem is to be solved using dynamic programming.
- e) Define NP-complete class of problem with example.

Q3) Attempt any four of the following:

[4×5=20]

- a) Explain algorithm based on DFS for finding strongly connected component of directed graph. Find the strongly connected components of the following graph.



- b) Explain Strassen's matrix multiplication method.
- c) What is the best way to multiply a chain of matrices with dimensions that are $13 \times 5, 5 \times 89, 89 \times 3, 3 \times 34$ using dynamic programming.
- d) Explain algorithm to construct Huffman code for the following character set.

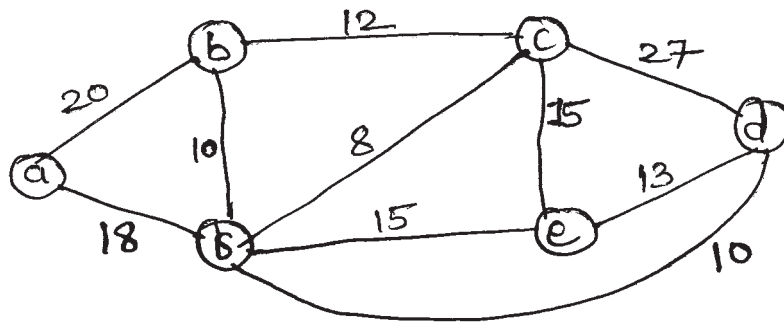
Character	Frequency
i	100
@	10
a	55
\$	15
q	63
b	42

- e) Write insertion sort algorithm & derive its best case & worst case running time.
- f) What is m-colorability graph problem? give the formulation for explicit & implicit constraints in case of m-colorability graph problem with n nodes.

Q4) Attempt any four of the following:

[4×6=24]

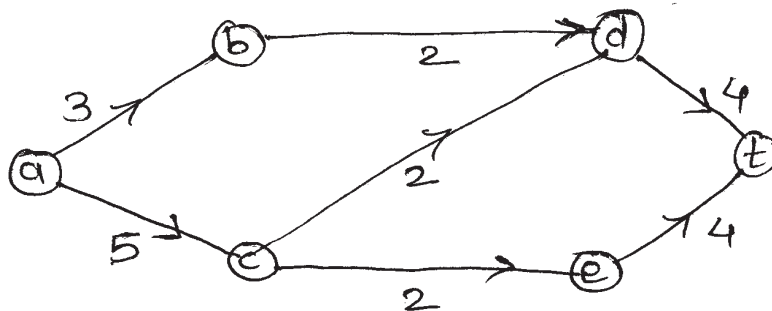
- a) What is minimum spanning tree? Using Kruskal's algorithm, find the minimum spanning tree of following graph G.



- b) Find the optimal solution to the knapsack problem instance: $n = 4$, $m = 8$, $w = (3, 8, 6, 4)$ & $P = (9, 10, 12, 9)$ using dynamic programming.
- c) Solve the given instance of Travelling Salesperson problem by using LCBB method.

$$\begin{bmatrix} \infty & 10 & 15 & 20 \\ 5 & \infty & 9 & 10 \\ 6 & 13 & \infty & 12 \\ 8 & 8 & 9 & \infty \end{bmatrix}$$

- d) Find the maximum flow in the network given below. The number on the edges represent their capacities. Here a is source & t is sink.



- e) Write a non-deterministic algorithm for max-clique decision problem.
- f) Define sum of subset problem. What are the rules for generating state space tree.

EEE

Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :3

P1757

[5133] - 21

M.Sc. -I

COMPUTER SCIENCE

CS-201: Advanced Networking

(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) Figures to the right indicate full marks.*

Q1) Attempt all of the following:

[8×2=16]

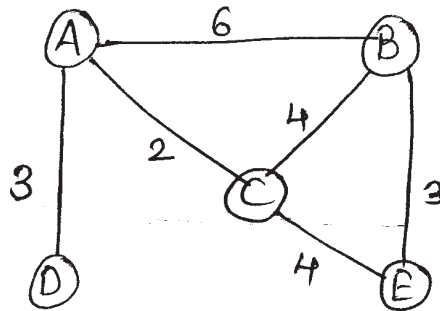
- a) Define the goals of security.
- b) What is AAL? In which protocol is used? Specify the layer.
- c) Define streaming live audio | video.
- d) Why does RTP need the service of another protocol. RTCP but TCP does not?
- e) What is hidden terminal problem?
- f) Define out-of-band signaling.
- g) IP is a best effort delivery protocol. Justify.
- h) State ICMP error reporting and query messages.

P.T.O.

Q2) Attempt any four of the following:

[4×4=16]

- a) Create a shortest path tree by using Dijkstras algorithm for Node A. Explain the steps.



- b) Explain the options supported by IPV4 & IPV6.
c) Explain the characters used by TELNET client to control the remote server.
d) Discuss the implementation of fast ethernet.
e) Explain the applications of UDP.

Q3) Attempt any four of the following:

[4×4=16]

- a) Explain SNMP messages in detail.
b) Explain the connectionless iterative server with socket interface.
c) Explain the different messages supported by RTCP.
d) Can the calculated sending time, receiving time or round trip time have a negative value? Why or why not? Give example.
e) Discuss the symmetric & asymmetric release of TCP.

Q4) Attempt any four of the following:

[4×4=16]

- a) Show the message transfer phase from aaa@ xxx.com to bbb@ yyy.com. The message is “Good Morning”.
b) What is the need fo SIP? Explain the messages used in SIP.
c) Explain the DHCP header format with option field.
d) Explain how TCP handles congestion control.
e) In a datagram, the m bit is zero, the value of HLEN is 5, the value of total length is 200 and the offset value is 200.

What is the number of the first byte and the number of the last byte in this datagram? Is this the last fragment, the first fragment or a middle fragment? Justify.

Q5) Attempt any four of the following:

[4×4=16]

- a) Explain the response messages of DNS.
- b) Explain the scenario where Tomlinson's clock based method is applied.
- c) Explain how non ASCII data is sent through E-mail?
- d) Write a note on VPN architecture.
- e) Explain Multicast routing and state approaches used to reduce the complexity of multicast routing.

EEE

Total No. of Questions : 5]

SEAT No. :

P1758

[5133]-22

[Total No. of Pages : 3

M.Sc.

COMPUTER SCIENCE

CS - 202 : Unix Internals

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

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

Q1) Attempt ALL of the following:

[8 × 2 = 16]

- a) Write and explain open system call.
- b) Explain the structure of buffer pool.
- c) What is difference between swapping and demand paging?
- d) What is delayed write?
- e) List region table entries.
- f) Explain nice system call.
- g) What is difference between incore inode and a buffer header?
- h) Write various flags used in status field of an incore inode.

Q2) State whether the following statements are true or false. Justify your answer (Any four):

[4 × 4 = 16]

- a) Zombie processes are never swapped.
- b) Process waiting for 'an inode to become free' will wake up only when that inode becomes free.
- c) No process can preempt another process executing in the kernel.
- d) Process zero (0), the swapper, is the only process that swaps processes into memory from swap devices.
- e) When a file system is unmounted, the buffers allocated to different disk blocks of that file system are always put at the end of the free list of buffers.

P.T.O.

Q3) Attempt any four of the following:

[4 × 4 = 16]

- a) Give the overview of file subsystem.
- b) Explain the five scenario, the kernel may follow in getblk to allocate a buffer for disk block. Explain any one.
- c) Write a note on system calls for Time.
- d) Which different userids are associated with the process? What is their significance? Which system call is used to change these ids?
- e) Explain deadlock scenario for link system call.

Q4) Attempt Any Four of the following:

[4 × 4 = 16]

- a) Write a program where parent and child share the same file.
- b) Consider the program given below: What is the return value for all the reads and what is the contents of the buffer? Describe what is happening in the kernel during each read?

```
#include <fcntl.h>

main()
{
    int fd;
    char buf [1024];
    fd = create ("junk", 0666);
    lseek (fd, 3000L, 2);
    write (fd, "hello", 5)
    close (fd);
    fd = open ("junk", 0_RDONLY);
    read (fd, buf, 1024);
    read (fd, buf, 1024);
    read (fd, buf, 1024);
}
```


- c) Explain the behaviour of the following program.

```
#include <signal.h>
main()
{
    extern catcher ();
    signal (SIGCLD, catcher);
    if (fork ( ) == 0)
        exit();
    pause();
}
catcher ( )
{
    printf (“parent caught sig\n”);
    signal (SIGCLD, catcher);
}
```

- d) Write a program that prints the owner, file type, access permission and access time of files supplied as parameters.
- e) Write a program to print inode number of every file of directory. (Accept directory name from user).

Q5) Attempt any four of the following:

[4 × 4 = 16]

- a) Draw and Explain a neat labelled diagram for process state transition.
- b) Explain how kernel converts read/write offset into physical disk block no. write Algorithm.
- c) Draw and Explain a block diagram of kernel.
- d) What is the context of a process? What are different situation under which kernel needs to save the context of a process.
- e) What is page aging? Explain with state diagram.



Total No. of Questions : 5]

SEAT No :

P1759

[5133]-23

[Total No. of Pages :2

M.Sc.-I

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 diagram must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

Q1) Attempt the following:

[8×2=16]

- a) State phases of unified process.
- b) What is pattern?
- c) What are types of responsibilities.
- d) Give collaboration of Abstract Factory Design pattern.
- e) State implications of definitions of Software Architecture.
- f) What are three ways to apply UML?
- g) Which are knowing responsibilities in GRASP?
- h) State the benefits of Iterative development life cycle.

Q2) Attempt any Four of the following:

[4×4=16]

- a) What are the properties of patterns for Software Architecture?
- b) What is Software Architecture? Why Software Architecture is important.
- c) What are VP phases?
- d) Explain how design patterns are classified?
- e) Discuss Allocation Architectural structure.

P.T.O.

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

- a) Write short note on Activity Diagram.
- b) Give structure and collaboration of strategy design pattern.
- c) Discuss intent, collaboration, and implementation of Command Design Pattern.
- d) With the help of suitable example, explain creator GRASP.
- e) With the help of example, illustrate controller YRASP.

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

- a) What are the scopes of Resources in struts framework?
- b) What are the consequences and implementation issue of singleton design pattern?
- c) Which are the common forms of coupling?
- d) “Decorator Design pattern attach additional responsibilities statically”, Justify.
- e) Draw a neat diagram of struts framework.

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

- a) With the help of diagram, explain web Tier of struts framework.
- b) What are different approaches of component based development?
- c) Consider PAN card registration form with fields Name, Address, DOB, Mob No., email ID. Apply validator framework of struts for above fields.
- d) Explain Intent and applicability of Abstract factory Design pattern.
- e) Write a short note on MVC model.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :3

P1760

[5133] - 31

M.Sc.

COMPUTER SCIENCE

**CS23-301: Software Metrics and Project Management
(2008 Pattern) (Semester - III) (Old & New)**

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) Define MTTF and MTTR.
- b) List the types of constraints of Project.
- c) Define faults and failures.
- d) List the tools used for Quality Control.
- e) List the contents of Risk Register.
- f) Define Payback Analysis.
- g) State attributes of software size.
- h) Define Project management.

Q2) Attempt any four of the following:

[4×4=16]

- a) Write a note on:
 - i) Gantt Chart.
 - ii) PERT.

P.T.O.

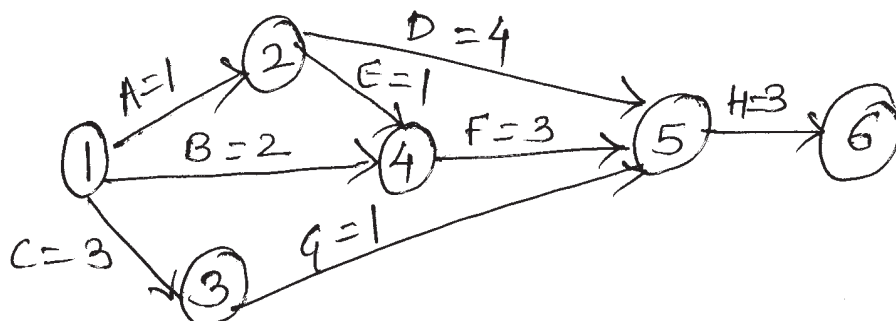
- b) Explain Project life cycle in detail.
- c) Explain various cost estimation tools and techniques.
- d) State the activities involve in data analysis and explain sampling & data distribution techniques.
- e) What is CCB? Explain change control system role in project management.

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

- a) What is Project Integration Management and explain its processes.
- b) Define activity sequencing and explain three types of dependencies in Time management.
- c) Explain characteristics of Good Data.
- d) Define Metric plan and explain and explain what, where, when and how metric plan.
- e) Explain negative Risk Response in Risk Management.

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

- a) Explain any four approaches for developing work breakdown structure.
- b) Write a note on software reliability.
- c) Explain levels of Process maturity model.
- d) What is critical path and find critical path for following.



- e) Explain Maslow's theory in human resource management.

Q5) Attempt any four of the following:

[4×4=16]

- a) Explain tools and techniques used in planning purchase and acquisition.
- b) Explain performance reporting in communication management.
- c) List and explain tools used in Quality Assurance.
- d) Define Scope verification and Scope Control.
- e) What is use of Responsibility Assignment matrices in Human Resource Management?

EEE

Total No. of Questions : 5]

SEAT No :

P 1761

[5133]-32

[Total No. of Pages :2

M.Sc.

COMPUTER SCIENCE

CS-23-302: Mobile Computing
(2008 Pattern) (Semester-III)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt all questions.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt all the questions:

[8×2=16]

- a) What is the difference between CDC and CLDC?
- b) What is KVM?
- c) What is frequency division duplex?
- d) What is COA?
- e) Compare HLR with VLR.
- f) What are the functions of Gateway GSN in GPRS?
- g) What is the purpose of display class in J2ME?
- h) What is good code for CDMA?

Q2) Attempt any four questions.

[4×4=16]

- a) How does T-TCP reduce standard TCP overheads?
- b) What are the advantages and disadvantages of cellular system.
- c) Explain architecture of MMS.
- d) Explain Packet Reservation Multiple Access (PRMA) scheme.
- e) What is snooping? Why it is used in TCP?

P.T.O.

Q3) Attempt any four questions. **[4×4=16]**

- a) Write a note on Radio subsystem of GSM.
- b) Explain in brief the encapsulation mechanism used in mobile IP.
- c) Compare proactive protocols and reactive protocols.
- d) Why, typically, is digital modulation not enough for radio transmission?
- e) Explain Coda file system.

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

- a) What are the constraints possible on Text Box in J2ME?
- b) What are the features of WML?
- c) How localization is achieved in GSM?
- d) 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?
- e) What are the extensions added by DSDV to standard distance vector algorithm? Why are they necessary?

Q5) Attempt any four questions. **[4×4=16]**

- a) Write a short note on alternative metrics.
- b) Compare Text Box control and Text field control.
- c) What are the different types of commands does J2ME supports?
- d) Explain the logical reference model of location services.
- e) What improvements are needed in TCP for 2.5/3G networks?



Total No. of Questions : 5]

SEAT No :

P1762

[5133]-33

[Total No. of Pages :2

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 diagram must be drawn whenever necessary*

Q1) Attempt all of the following:

[8×2=16]

- a) What is access control?
- b) Write the contents of digital certificate.
- c) What is steganography.
- d) Explain any two applications of IPsec.
- e) Write the features of authentication token.
- f) What is a virus and worm.
- g) What are the requirements of a message digest?
- h) Using Rail fence technique construct cipher text for the plain text "Information Systems Security".

Q2) Attempt any four of the following:

[4×4=16]

- a) Differentiate between Symmetric and Asymmetric key cryptography.
- b) What are the steps to create Digital Certificate? Explain each step in detail.
- c) Explain ESP and its mode of operations.
- d) Write short note on intrusion detection.
- e) Consider the plain text "COME FOR MEETING" and keyword "PLAYFAIR EXAMPLE".Using playfair cipher construct cipher text.

P.T.O.

Q3) Attempt any four of the following:

[4×4=16]

- a) Explain man-in-the-middle attack.
- b) Discuss the working of kerberos protocol.
- c) Which participants are involved in SET? Explain in detail their role in SET.
- d) Explain working of RC5 algorithm.
- e) Consider the following key matrix.

$$\begin{bmatrix} 6 & 24 & 1 \\ 13 & 16 & 10 \\ 20 & 17 & 15 \end{bmatrix}$$

Using Hill cipher method, construct the cipher text for the plain text “RAT”.

Q4) Attempt any four of the following:

[4×4=16]

- a) Explain broad level steps of DES.
- b) What are the steps to encrypt the plain text using Blowfish algorithm?
- c) How SSL achieves confidentiality and integrity?
- d) What is firewall? Explain the limitations of firewall.
- e) Consider the plain text “20”. Let P=7 and Q=17. Construct the cipher text using RSA algorithm.

Q5) Attempt any four of the following:

[4×4=16]

- a) Explain cipher Block chaining mode of an algorithm.
- b) Explain working of SHA.
- c) How to use RSA algorithm for digital signature?
- d) Explain the broad level steps in PEM.
- e) How challenge/response token is used for authentication?



Total No. of Questions : 5]

SEAT No. :

P3608

[Total No. of Pages : 3

[5133]-102
M.Sc. (Part - I) (Semester - I)
COMPUTER SCIENCE
CS - 102 : Advanced Networking
(2011 Pattern)

Time : 3 Hours]

[Max. Marks : 80

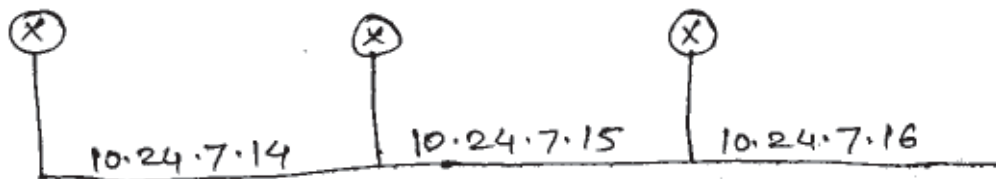
Instructions to the candidates:

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

Q1) Attempt any eight of the following :

[8 × 2 = 16]

- a) What is maximum and minimum size of TCP header?
- b) If a packet has arrived with an M bit value of 1 and fragmentation offset value of 0, Is this the first fragment, last fragment or middle fragment.
- c) Why does a newly added host need to know address of a router.
- d) Give network link LSA



- e) What is certification authority (CA)?
- f) Define ADSL.
- g) State types of user agents with examples?
- h) List different fields of ethernet frame format?
- i) What is virus? State the phases of virus lifetime.

P.T.O.

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

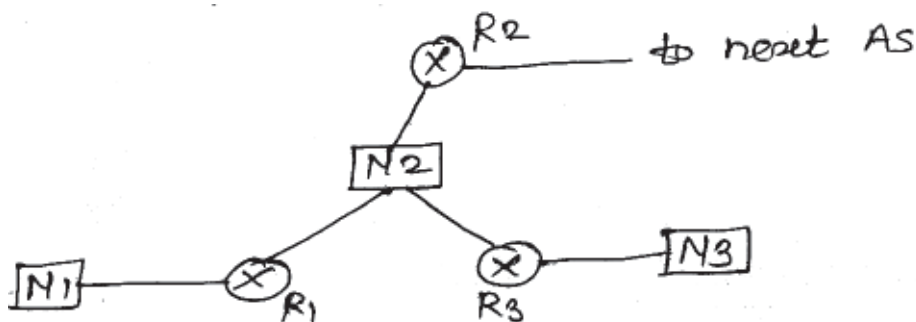
- a) Explain identification and flags field related to fragmentation field of IPv4.
- b) Explain how concept of multiplexing is used at transport layer.
- c) Discuss EcB mode in brief.
- d) How to use metafile for accessing audio, video files from server?
- e) Describe how TCP handles congestion.

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

- a) Explain OSPF header format.
- b) Let plaintext = "How ARE YOU" one time pad is "MCBTZQARX". Find cipher text using vernam cipher.
- c) Explain different types of attack.
- d) Explain different strategies of transition from IPv4 to IPv6.
- e) Explain in brief types of times in RIP.

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

- a) Explain PGP operations.
- b) Explain RTCP in brief.
- c) Discuss header length and total length fields of IPv4 datagram.
- d)



Which routers send out router link LSA and network link LSA?

- e) Write note on stub and multihomed AS.

Q5) Attempt any four of the following :

[4 × 4 = 16]

- a) Explain working of Kerberos?
- b) What are typical content of Digital certificate.
- c) Explain informational message in Icmpv6.
- d) Explain RSA Algorithm.
- e) Discuss 3 way handshaking method in TCP.



Total No. of Questions : 8]

SEAT No. :

P3609

[Total No. of Pages : 3

[5133]-201
M.Sc. (Semester - II)
COMPUTER SCIENCE
CS - 201 : Digital Image Processing
(2011 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any four from the remaining.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*

Q1) Attempt all of the following :

[8 × 2 = 16]

- a) What is smoothing?
- b) What is structuring element? Draw any two standard shapes.
- c) Calculate the memory required to store a black and white image with 256 gray levels and 1024 × 1024 resolutions.
- d) State any two methods of generating signatures
- e) Define digital image.
- f) Define the city block distance between pixels 'p' and 'q' of an image.
- g) Define linear & non-linear operation in DIP.
- h) What is the difference between an edge and a boundary?

Q2) a) Explain Erosion & Dilation with the help of diagrams. Show that erosion & Dilation are duals of each other. **[8]**

b) Write a short note on low pass filter for image processing. **[4]**

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

P.T.O.

- Q3)** a) Give three different ways of acquiring image and explain any one in details. Mention an application of each method. [8]
- b) Explain the process of harmonic filtering. Mention its application. [4]
- c) Give the orientation of the lines which will be detected using following four mask. [4]

-1	-1	-1	2	-1	-1	-1	2	-1	-1	-1	2
2	2	2	-1	2	-1	-1	2	-1	-1	2	-1
-1	-1	-1	-1	-1	2	-1	2	-1	2	-1	-1

- Q4)** a) Describe the fundamental steps in digital image processing with the help of a block diagram. [8]
- b) Explain bit plane slicing. [4]
- c) Define 8-adjacency and m-adjacency. What is the advantage of m-adjacency. [4]
- Q5)** a) Explain the steps in Frequency domain processing of digital image. [8]
- b) What are the Fundamental steps in edge detection. [4]
- c) What is 'Gamma Correction'? How is it implemented using power law transformation. [4]
- Q6)** a) What is the use of 'Hit-or-Miss' transformation? Explain the morphological operations involved in this transformation using suitable diagram. [8]
- b) Give any two probability distribution and mention their sources. [4]
- c) Write a short note on log transformation. [4]
- Q7)** a) Define 'Opening' and 'Closing' operations. In what way do they differ from each other? [8]

- b) Explain what is meant by unsharp masking and highboost filtering. [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]

- Q8) a) Use the following table to find the transformation function that is obtained with histogram equalization techniques, the image is a 3-bit 64×64 digital image. [8]

r_1	nK
$r_0 = 0$	790
$r_1 = 1$	1023
$r_2 = 2$	850
$r_3 = 3$	656
$r_4 = 4$	329
$r_5 = 5$	245
$r_6 = 6$	122
$r_7 = 7$	81

- b) Write the iterative algorithm for global thresholding. [4]
- c) Write a short note on contrast stretching. [4]



Total No. of Questions : 5]

SEAT No. :

P3610

[Total No. of Pages : 5

[5133]-202
M.Sc. (Semester - II)
COMPUTER SCIENCE
CS - 202 : Advanced operating system
(2011 Pattern)

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.*
- 4) *Assume suitable data if necessary.*

Q1) Attempt all of the following :

[8 × 2 = 16]

- a) Write any four inode operations.
- b) State the characteristics of UNIX file system.
- c) What is ACL?
- d) What do you mean by Alignment of data?
- e) Explain sending signal with pay load?
- f) Define the use of atexit () function.
- g) Explain symlink () and readlink () function.
- h) State the components of register context.

Q2) Justify the following (any eight) :

[8 × 2 = 16]

- a) A process never executes in user mode before handling outstanding signals.
- b) Kernel keeps the inode locked across the execution of system call.
- c) At kernel level, support for protected process is two fold.

P.T.O.

- d) dup () system call duplicates the contents of the file.
- e) The new thread pool implementation increases the scalability of applications.
- f) We can set only one of the two time values with the utime function.
- g) No process can preempt another process execution in kernel.
- h) getuid () and setuid () functions are available in signal h file.
- i) Process 'O' and process 'I' exists through the lifetime of a system.

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

- a) Explain the following functions
 - sigaction ()
 - sigpending ()
- b) Explain thread scheduling scenario in detail.
- c) Explain the data structure that gets updated after two process opens a file.
- d) Define Daemon process and write the steps for creating a daemon.
- e) Explain the architecture of UNIX operating system with Kernel in detail.

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

- a) Explain the behaviour of following C program

```
#include <signal.h>
main()
{
    int 1, *iP;
    extern f ( ), sigcatch ( );
    iP = (int *)f;
    for (i=0; i<20;i++)
        signal (1, sigcatch);
```

```

    *iP = 1;
    printf("After assign to iP/n");
    f();
}
f(){ }
sigcatch (n)
    int n;
    {
        printf ("caught sig %d ln", n);
        exit(1);
    }

```

- b) Explain the behavior of following C program

```

main( )
{
    int l,
    char * CP;
    extern char * sbrk ( );
    CP = sbrk (10);
    for (i=0; i < 10 ; i + +)
        * CP + + = 'a' + 1;
    sbrk (-10);
    for (i = 0; i < 10; i + +)
        printf("char %d = %c", l, *CP + +);
}

```

- c) Explain the behaviour of following 'C' program
- ```
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));
}
```
- d) Explain the behaviour of following 'C' program
- ```
#include <signal.h>
main(int argc, char * argv[ ])
{
    char buf [256];
    if (argc !=1)
        signal.(SIG-CLD,SIG-IGN);
    while (read (0, buf, 256))
        if (fork ( )= = 0)
            exit (0);
}
```
- e) Explain the behaviour of following 'C' program
- ```
main()
{
 int status;
 if (fork () = = 0)
 execl ("/bin/date","date",0);
 wait (& status);
}
```

**Q5)** Attempt the following (any four) :

**[4 × 4 = 16]**

- a) Write a C program to read data from standard input and write it directly to user define file.
- b) Write a c program to illustrate use of time ( ) system call.
- c) Write a c program to print size, type of file.
- d) Write a c program to open a file in write append mode. Suppose size of file is n bytes. At the (n + 100)<sup>th</sup> byte the same file, write the string "UNIX".
- e) Write a c program to catch SIGUSR1 and SIGUSR2.



Total No. of Questions : 5]

SEAT No. :

P3611

[Total No. of Pages : 3

**[5133]-203**  
**M.Sc. (Semester - II)**  
**COMPUTER SCIENCE**  
**CS - 203 : Data Mining and Data Warehousing**  
**(2011 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Draw neat diagram wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt any eight of the following :

**[8 × 2 = 16]**

- a) What is FP-tree?
- b) What is snowflake schema?
- c) What is CART?
- d) What do you mean by parameter leaching?
- e) What is clustering panel in weka?
- f) What are Bayesian classifier?
- g) Give any 2 applications of data mining.
- h) What is correlation clustering?
- i) Give any 2 application of Text mining.
- j) What is concept hierarchy?

**Q2)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Explain OLAP operations in multidimensional data model.
- b) Discuss Bayesian Network.

**P.T.O.**

- c) What are the different ways of handling noisy data?
- d) What is Tree Pruning Methods? Discuss different tree Pruning ways.
- e) Discuss the issues that has to be considered during data integration.

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

- a) How the web mining task can be classified? Discuss any one in detail.
- b) Cluster the following eight points with (x,y) representing locations into three clusters A1 (2,10), A2 (2,5), A3 (8,4), A4 (5,8), A5 (7,5), A6 (6,4), A7 (1,2), A8 (4,9).

Initial cluster centers are : A1 (2,10), A4 (5,8) and A7 (1,2), The distance function between two points a = (x<sub>1</sub>,y<sub>1</sub>) and b = (x<sub>2</sub>,y<sub>2</sub>) is defiend as :

$$p(a,b) = |x_2 - x_1| + |y_2 - y_1|.$$

Use K - means algorithm to find the three cluster centers after the second iteration.

- c) Construct the 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     |

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

- a) Explain sampling algorithm with an example.
- b) List and briefly explain the issues in classification.
- c) Explain Expectation Maximization Algorithm in detail.
- d) Explain correlation clustering.
- e) Explain the preprocessing steps allied to data to improve accuracy, efficiency and scalability of the classification or prediction process.

**Q5)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Explain following accuracy measures (any two)
  - i) Bootstrap
  - ii) F-measure
  - iii) Precision
  - iv) Cross - validation
- b) Explain steps involved in Knowledge Discovery.
- c) Explain concept of Prediction. Discuss types of regression.
- d) Discuss FP - growth algorithm.
- e) How data warehouse is different from a database? How are they similar?





Total No. of Questions : 5]

SEAT No. :

**P1763**

**[5133]-301**

[Total No. of Pages : 2

**M.Sc.**

**COMPUTER SCIENCE**

**CS - 301 : Software Metrics and Project Management  
(2011 Pattern) (Semester - III) (New)**

*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) Why is project temporary and uncertain?
- b) Define:- i) Milestone ii) Three - point estimate
- c) GQM approach is helpful to managers and developers comment.
- d) What are goals of communication management.
- e) List any four common elements of project management plan.
- f) List the top ten risk item tracking?.
- g) Define:- i) survival function ii) Hazard rate
- h) What type of information goes in quality assurance plan?.

**Q2)** Attempt any four of the following

**[4×4=16]**

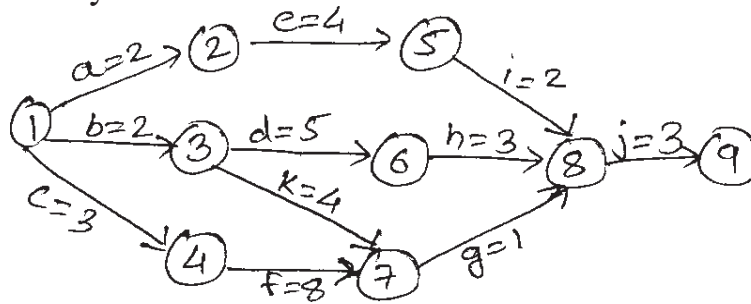
- a) Consider the example of designing a website for aircraft system.Design the work Breakdown structure for the above system.
- b) What are the basic components of a metric plan? Explain any two of them in brief?
- c) What are the key success factors for implementing any s/w model in the organization?
- d) Summarize the process involve in project integration management?
- e) what is the significance of code reuse? What are different types of reuse based on their extent?

**P.T.O.**

**Q3)** Attempt any four of the following.

**[4 × 4 = 16]**

- a) Define critical path? Find critical path for given network using critical path analysis method?



- b) What are different aspects of size in measuring internal product attributes of software metrics?
- c) Explain the make -or -buy analysis and describe how to perform the financial calculations involved in the simple lease or buy example for purchasing PCs.(Computers).
- d) What are the outputs of quality control process?
- e) Explain four basic response categories for negative risk in project risk management?

**Q4)** Attempt any four of the following:

**[4×4=16]**

- a) What is organizational structure? Explain functional organization structure in detail.
- b) Write a short note on resource planning?
- c) How do we measure productivity? How does team structure affects productivity
- d) What are various methods of improving project communication? explain any two in detail.
- e) Write a short note on stakeholder analysis.

**Q5)** Attempt any four of the following :

**[4×4=16]**

- a) Explain in detail project scope statement.
- b) Which factors affects the quality of IT projects?
- c) What are different methods used for selecting projects?
- d) What is activity duration estimating?
- e) Differentiate internal product attribute and external product attribute based on various entities.



Total No. of Questions : 5]

SEAT No :

**P 1764**

**[5133]-302**

[Total No. of Pages :2

**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) What is cell breathing?
- b) List any two functions of base station controller (BSC) used in GSM.
- c) Define the following:
  - i) Frequency division duplex
  - ii) Persistent mode of mobile TCP
- d) List the advantages of cellular IP.
- e) Define long term Fading.
- f) Compare in between CO-COA & FA-COA.
- g) List the disadvantages of snooping TCP.
- h) Why physical layer performs encryption in wireless?

**Q2)** Attempt any four of the following:

**[4×4=16]**

- a) Explain the Push Access Protocol.
- b) Explain logical reference model of location based services in GSM.
- c) Explain MACA protocol with its advantages & disadvantages.
- d) What could be quick 'solutions' & why don't they work in mobile IP?
- e) What are functions of authentication & encryption in GSM? How is system security maintained?

**P.T.O.**

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

- a) What are the different types of handovers supported in UMTS.
- b) 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?
- c) What is spread spectrum? Discuss direct sequence spread spectrum.
- d) Give the differences between wired networks & ad-hoc wireless networks related to routing.
- e) Name the inefficiencies of mobile IP regarding data forwarding from a correspondent node to mobile node. What are optimizations & what additional problems do they cause?

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

- a) Why is a new infrastructure needed for GPRS, but not for HSCSD? Which components are new & what is their purpose?
- b) Compare in between SDMA, TDMA & CDMA.
- c) Discuss the working of snooping TCP & transaction oriented TCP.
- d) Explain Wireless Application Environment (WAE).
- e) Discuss the features of Android.

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

- a) What is profile in J2ME? Name all profiles that J2ME supports? What facilities MIDP profile provides?
- b) How wireless transport layer establishes a secure session?
- c) Explain UMTS system architecture.
- d) Name the requirements of mobile IP & justify them.
- e) Explain the mobile originated SMS procedure.



Total No. of Questions :5]

SEAT No. :

**P1765**

[Total No. of Pages :4

[5133] - 303

M.Sc.

COMPUTER SCIENCE

CS-303: Soft Computing

(2011 Pattern) (Semester - III) (New)

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

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

**Q1)** Attempt all:

**[8×2=16]**

- a) State the equation for logistic signal function.
- b) State any two applications of GA.
- c) What is supervised learning?
- d) Find  $\tilde{A}^c \cup \tilde{B}$  for the following two fuzzy sets  $\tilde{A}$  &  $\tilde{B}$ .

$$\tilde{A} = \left\{ \frac{.1}{50} + \frac{.5}{75} + \frac{.7}{100} + \frac{.9}{125} + \frac{1}{150} \right\}$$

$$\tilde{B} = \left\{ \frac{.2}{75} + \frac{.4}{100} + \frac{.6}{125} + \frac{1}{150} \right\}$$

- e) What is dilation?
- f) State any two basic operations in GA.
- g) Draw the generic architecture of a feed-forward neural network.
- h) Draw a diagrammatic representation of a fuzzy set A and its complement.

**P.T.O.**

Q2) Attempt any four:

[4×4=16]

- What is defuzzification? Explain the weighted average and mean-max membership methods for defuzzifying fuzzy output.
- Explain the features of membership function.
- Explain the advantages and disadvantages of GA.
- Write a short note on steepest Descent search with exact gradient information.
- Comment - Binary neurons are pattern dichotomizers.

Q3) Attempt any four:

[4×4=16]

- Given the following two fuzzy sets.

$$\tilde{A} = \left\{ \frac{.2}{35} + \frac{.6}{42} + \frac{1}{50} + \frac{.8}{57} + \frac{.4}{65} \right\}$$

$$\tilde{B} = \left\{ \frac{.3}{42} + \frac{1}{50} + \frac{.6}{57} + \frac{.3}{65} \right\}$$

Find

- $\tilde{B} | \tilde{A}$
  - $\overline{\tilde{A} \cap \tilde{B}}$
- For the following fuzzy relation  $\tilde{R}$ , find the  $\lambda$ -cut relation for  $\lambda \cdot 8$ ,  $\lambda \cdot 4$ ,  $\lambda_{6.5}$  and  $\lambda_1$

$$\tilde{R} = \begin{matrix} & x_1 & x_2 & x_3 & x_4 \\ \begin{matrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{matrix} & \begin{bmatrix} 1 & .3 & .6 & .8 \\ .3 & 1 & .2 & .7 \\ .6 & .2 & 1 & .2 \\ .8 & .7 & .2 & 1 \end{bmatrix} \end{matrix}$$

- c) Given the following fuzzy numbers  $\tilde{K}$  and  $\tilde{P}$ , using Zadeh's extension principle calculate fuzzy number "approximately 18". What can you say about the resulting set?

$$\tilde{K} = \text{approximately } \tilde{3} = \left\{ \frac{0}{0} + \frac{.4}{1} + \frac{.8}{2} + \frac{1}{3} \right\}$$

$$\tilde{P} = \text{approximately } \tilde{6} = \left\{ \frac{.3}{4} + \frac{.7}{5} + \frac{1}{6} + \frac{.8}{7} \right\}$$

- d) Determine the proposition "IF  $\tilde{P}$  THEN  $\tilde{C}$ " for the fuzzy sets given below.

$$\tilde{P} = \left\{ \frac{.8}{9} + \frac{1}{b} + \frac{.6}{U} \right\}$$

$$\tilde{C} = \left\{ \frac{1}{y} + \frac{.4}{n} + \frac{.2}{Q} \right\}$$

- e) Given the following two fuzzy sets

$$\tilde{T} = \left\{ \frac{0}{1} + \frac{.2}{2} + \frac{.5}{3} + \frac{.8}{4} + \frac{1}{5} \right\}$$

$$\tilde{H} = \left\{ \frac{1}{1} + \frac{.9}{2} + \frac{.5}{3} + \frac{.3}{4} + \frac{0}{5} \right\}$$

Find membership functions for:

- i) not very  $\tilde{T}$  & not very  $\tilde{H}$
- ii) slightly  $\tilde{T}$  or not  $\tilde{H}$

**Q4)** Attempt any two:

**[2×8=16]**

- a) Explain any two properties of neural networks. Differentiate between supervised & unsupervised learning.
- b) Define linear separability and show that the 2D Boolean function 'OR' is linearly separable.

- c) Let  $X = \{x_1, x_2, x_3\}$ ,  $Y = \{y_1, y_2, y_3, y_4\}$  &  $Z = \{z_1, z_2, z_3, z_4\}$  be the universe of discourse on which the following fuzzy sets are defined respectively.

$$\underline{A} = \left\{ \frac{0.4}{x_1} + \frac{0.8}{x_2} + \frac{1}{x_3} \right\} \quad \underline{B} = \left\{ \frac{.2}{y_1} + \frac{.6}{y_2} + \frac{1}{y_3} + \frac{.8}{y_4} \right\} \quad \underline{C} = \left\{ \frac{.6}{z_1} + \frac{1}{z_2} + \frac{.8}{z_3} + \frac{.3}{z_4} \right\}$$

Find

i)  $\underline{R} = \underline{A} \times \underline{B}$

ii)  $\underline{S} = \underline{B} \times \underline{C}$

iii)  $\underline{T} = \underline{R} \circ \underline{S}$

iv)  $\underline{U}^1 = \underline{R} \cdot \underline{S}$

**Q5)** Attempt any two:

**[2×8=16]**

- a) Simulate the execution of perceptron learning algorithm for each epoch on the following inputs:

(1, 1, 1) (1, 1, -1) (1, 0, -1) (-1, 1, 1) (-1, 1, -1) (-1, 0, -1) with weight vector (0, 0, 1) &  $\eta = 1$ . What is the final weight vector?

- b) Let  $X = \{a, b, c, d\}$  &  $Y = \{1, 2, 3, 4\}$  &

$$\text{Let } \underline{A} = \left\{ \frac{.2}{a} + \frac{.8}{b} + \frac{.6}{c} + \frac{.2}{d} \right\}$$

$$\underline{B} = \left\{ \frac{.3}{1} + \frac{1}{2} + \frac{.7}{3} + \frac{.1}{4} \right\}$$

$$\underline{C} = \left\{ \frac{0}{1} + \frac{.6}{2} + \frac{1}{3} + \frac{.6}{4} \right\}$$

Determine the implication relations:

- i) if  $x$  is in  $\underline{A}$  then  $y$  is in  $\underline{B}$
- ii) if  $x$  is in  $\underline{A}$  then  $y$  is in  $\underline{B}$  else  $y$  is in  $\underline{C}$
- c) Explain the basic genetic algorithm. Maximize  $f(x) = 2x + 1$  over  $\{0, 1, 2, 3, \dots, 31\}$  with initial  $x$  values of (10, 22, 9, 13).

*EEE*