ME - I Sem - COMP
Parallel Computer Architecture

4/12/07

Con. 5148-07.

BB-7518

(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions out of the remaining **six** questions.

1. (a) Explain cube interconnection network and Barrel shifter with example for SIMD. **10**
   (b) Discuss Data flow machine architectures. State major design issues with it. **10**

2. (a) Discuss different vector optimization methods. **10**
   (b) Discuss different architectural classification schemes of parallel computers. **10**

3. (a) What is multicache coherence problem ? Discuss the solution for it. **10**
   (b) Write note on conditional critical sections and monitors. **10**

4. (a) Discuss classification of pipeline processor. **10**
   (b) How is the "detection of parallelism in program" carried out in multi processor system ? **10**

5. (a) What are the different associative memory organisation ? **10**
   (b) Discuss in detail parallel language features for vector processing with example. **10**

6. (a) Explain the operation of cache memories. Discuss design aspects of cache memories. **10**
   (b) Discuss various instruction prefetch and branch control strategies with their effect on performance of pipeline processor. **10**

7. Write note on any **two** of the following :– **20**
   (a) I/o processor and I/o channels
   (b) Classification of multiprocessors operating system
   (c) Data flow graphs.

ME - I sem - Comp
Algorithms & Complexity

10/12/07 ✓

P4/RT-Ex-07-304

Con. 5450–07. (2) BB–7522

(3 Hours) [Total Marks : 100

N.B. : (1) Questions No. **1** is **compulsory**.
(2) Answer any **four** questions out of remaining **six** questions.

1. (a) What is difference between dynamic and Greedy approach ? Explain manufacturing problem. 10

   (b) Explain RB–Tree insertion algorithm with all cases. 10

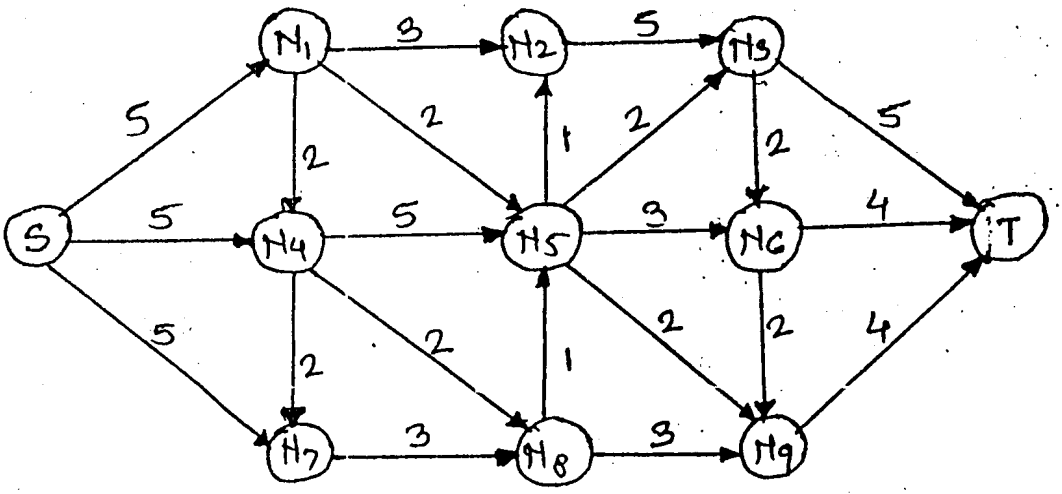
2. (a) Prove Vertex-Cover problem is NP-Complete. 10

   (b) Find a feasible solution for following :– 10

$x_1 - x_2 \leq 15$ $x_2 - x_3 \leq 10$
$x_3 - x_4 \leq -10$ $x_4 - x_6 \leq 10$
$x_4 - x_5 \leq -45$ $x_5 - x_6 \leq 55$
$x_1 - x_6 \leq 20$ $x_4 - x_2 \leq 4$.

3. (a) Define Co-NP problems. State a Co-NP problem and prove its class membership. 10

   (b) Evaluate the maximum flow from node S to node T (Edge represents capacity between nodes) 10

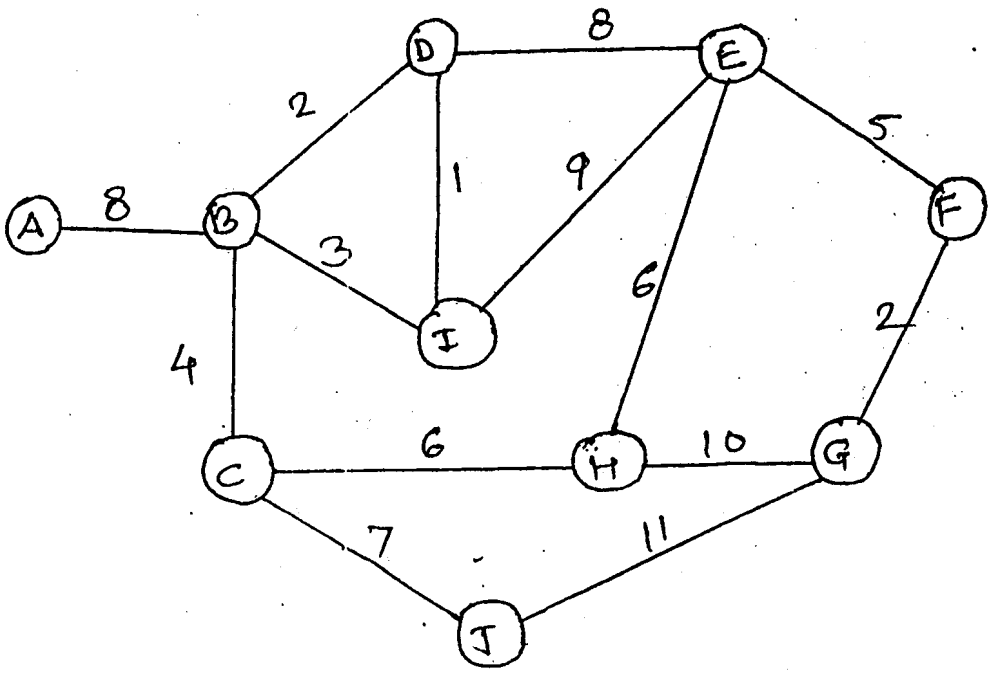


4. (a) Insert following keys in a hash-table of length 11. Show collision resolution results using linear probing and quadratic probing with values $C_1 = 1$ and $C_2 = 3$. 10
   Keys : 7, 10, 0, 3, 28, –5, 48, 99, 23, 33, 112

   (b) Generate variable length Huffman Code for following set of frequencies 10
   a : 20, b : 10, c : 15, d : 5, e : 22, f : 3.

[TURN OVER

5. (a) Compute minimum spanning tree for following graph using prims algorithm.



(b) Prove 3–colorability is NP-Complete.

6. (a) Solve the recurrence using Master Method –

(i) $T(n) = 9T(n/3) + n3$

(ii) $T(n) = 16T(n/4) + n$

(iii) $T(n) = 3T(n/4) + n \log n$

(iv) $T(n) = 2T(n/4) + \sqrt{n}$

(b) Find an optimal solution for matrix multichain with dimension sequence. < 15, 8, 10, 12, 3, 11, 4 >

7. Answer any **four** out of the following :–

(a) Compare BFS and DFS Techniques

(b) Explain B^+ Tree with operations insertion and deletion

(c) Chinese remainder theorem

(d) Comment on any two modules of computation

(e) Define θ, 0, Ω notations. State their interrelationship.

V-Ex-11-07-D- 67

ME - I Sem - Comp 14/12/07

Object - Oriented Analysis & Design

Con. 5233-07. BB-7524

(3 Hours) (3) [Total Marks : 100

N.B. : (1) Question No.1 is **Compulsory.**
(2) Attempt any **four** of remaining **six** questions.
(3) Assume any **suitable data** if **necessary** and **clearly state** it.
(4) **Figures** to **right** indicates **full** marks.

1. (a) What are OOP, OOD and OOA ? Explain how they are related. **10**
   (b) What makes software inherently complex ? How might some of the problems associated with software design be mitigated by design tools or methods ? **10**

2 (a) The book store sells textbooks but also many other items, ranging from Rhode Island College(RIC) sweatshirts to computers. The text purchasing Department has unique characteristics, including advance notice from faculty members and issue dealing with unsold copies. Purchasing the other items is as for any retail store. An extension of both areas is the checkout (or sales) process. This process should include the cash registers scanners and sales slips. In fact, this process often is unduly slow. Develop state transition diagrams for the above. **12**
   (b) What is concurrency ? How can you distinguish between heavy weight and light weight process ? **8**

3. (a) Write notes on :— **15**
   (i) Task planning.
   (ii) Resource allocation.
   (iii) Reuse in software development.
   (b) What is an Object ? What is a class ? How do you distinguish between the two construct ? **5**

4. (a) You are appointed as a consultant for the WEB SITE development of your college. You are required to develop data warehouse and web user mining. Write detailed statement of the problem and construct the module diagram and process diagram. **12**
   (b) Construct the component diagram and deployment diagram for the same. **8**

5. (a) What is a dynamic modeling ? Explain dynamic modeling with reference to state, events, conditions, activity, state and event generalization, shot diagram, internal actions, controlling operations. Give example of each. **10**
   (b) Explain how can you construct interaction diagram from use case analysis. Give suitable example. **10**

6. (a) Write detail note on: Object oriented software testing. **10**

(b) What is the purpose of evolution step in macro development process ? **10**
Explain the activities associated with evolution.

7. (a) What do you mean by 'Typing' ? For what kind of situations is strong typing likely to be most helpful ? When might it get in the way ? Also explain static binding and dynamic binding. **10**

(b) What do you mean by abstraction ? Give appropriate examples. Also what is entity abstraction, action abstraction, virtual machine abstraction and coincidental abstraction. **10**

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ME - I Sem - COMP 19/12/07

P-2 ws Oct 07 171

Elective I - Neural & Fuzzy Systems ✓

Con. 4990-07. (4) BB-7527

(3 Hours) [Total Marks : 100

(1) Question No. 1 is compulsory.
(2) Attempt any four questions out of remaining questions.
(3) Figures to the right indicate full marks.

Q1(a) Determine all α-level sets and all strong α-level sets for the following fuzzy set. 6

A = { (2,1), (4,0.2), (5,0.3), (6,0.4), (7,0.6), (8, 0.8), (10,1), (12, 0.8), (14, 0.6)}

For α = 0.3, 0.5, 0.8

(b) A single-neuron network using f(net) = sgn(net) has been trained using the pairs of x_i , d_i as shown below: 14

x1 = [1,-2, 3,-1] d1 = -1

x2 = [0,-1, 2,-1] d2 = 1

x3 = [-2, 0,-3,-1] d3= -1

The final weights obtained using the perceptron rule are W4 = [3 2 6 1]^t

Knowing that correction has been performed in each step for c= 1, determine the following weights:

W3, W2, W1 by back tracking the training.

Q2 Design a fuzzy controller to determine the wash time of domestic washing machine. Assume that input is dirt and grease on cloths. Use three descriptions for input variables and five descriptors for output variables. Derive set of rules for control action and defuzzification. The design should be supported by figures. Show that if the clothes are soiled to a larger degree the wash time will be more and vice-versa. 20

Q3 Determine the weights after one iteration for Delta learning rule. Use Bipolar continuous activation function. 20

Given the input pattern with desired output

X1 = [1, -2, 0, -1] d1= -1;

X2 = [0, 1.5, -0.5, -1] d2= -1;

X3 = [-1, 1, 0.5, -1] d3= 1;

Initial weight vector w1 = [1, -1, 0 , 0.5] assume learning constant c= 0.1

Perform correction of weight in each state and why this correction is required?

Q4 (a) Prove the following identities: 10

(i) For unipolar continuous activation function f ' (net) = O(1-O)

(ii) For bipolar continuous activation function f ' (net) = $(1-O^2)/2$

Where O is out.

(b) Explain with suitable diagram error back propagation training algorithm. 10

Q6 What do you mean by learning? List different learning rules and explain any three using suitable diagram. 20

Q7 Write short notes on (any two) : 20

(i) Bidirectional associative memory with its algorithm
(ii) Character recognition using neural network
(iii) Hopfield network
(iv) Single Continuous Perceptron Training Algorithm

ME - I Sem - Comp

Network Protocols & Networking

27/12/07

P4/RT-Ex-07-374

(5)

Con. 5864–07. **BB–7533**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of the remaining **six** questions.

Q. 1.a) Is it possible to send 10 MB file through UDP? Explain How? (10)
b) What is silly window syndrome? Explain in detail. (10)

Q. 2.a) The following is a dump of a TCP header in hex format
05 32 17 0000 00 01 00 00 00 00 50 02 07 FF 00 00 00 00
i) What is the source port number?
ii) What is the destination port number?
iii) What is the sequence number?
iv) What is the acknowledgement number?
v) What is the length of header?
vi) What is the type of the segment? (14)
vii) What is the window size?

b) What are the advantages of IPv6 over IPv4 (6)

Q. 3.a) An ISP granted a block of address starting with 190.100.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customer as follows:
i) The first group has 64 customers, each need 256 addresses.
ii) The second group has 128 customers, each need 128 addresses.
iii) The third group has 128 customers, each need 64 addresses. (12)
Design sub block and find out how many addresses are still available after these allocation?

b) Explain the ARP components diagrammatically. (8)

Q. 4.a) Explain the network management software architecture. (10)
b) Explain transport level support in SNMP. (10)

Q. 5.a) An ICMP message has arrived with header 05 00 11 12 11 0B 03 02 (Hex).

i) What is the type of message?

ii) What is the code?

iii) What is the value of last four bytes?

iv) What does the last four byte signify? (10)

b) Explain the user datagram format in detail. (10)

Q. 6.a) Explain path vector routing in detail. (10)

b) Calculate the checksum for the following decimal number. Give result in decimal use 16 bit format:

23 145 78 23 11 4 (10)

Q. 7. Write notes on any four of the following:

i) Layer 3 and Layer 4 switching.

ii) RARP.

iii) MIB.

iv) Sockets

v) Voice over IP.

vi) DNS. (20)

ME - I Sem - EXTC 4/12/07

Statistical Theory of Communication.

Con/5258–07. BB–7536

(3 Hours) (6) [Total Marks : 100

N.B. : (1) Attempt any **five** questions.
(2) **All** questions carry **equal** marks.
(3) Assume **suitable** data if **necessary** and state them **clearly.**

Q. 1. (a) Define the terms (1) Sample space (2) probability, stating the conditions required for probabilty measure. Prove the result 10

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

(b) Define the terms (i) Distribution function, and 10
(ii) Characteristic function. Prove the Tschebycheff inequality for a single real random variable.

Q. 2. (a) A channel carries K deterministic signals, $| s^{(i)} >$ that are 10
M dimensional vectors. Their amplitudes A_i are zero mean random variables with variance σ_i^2 respectively. The channel is also subjected to an additive, zero mean, white noise $| N >$. Thus the $m-th$ componant, $m = 1, 2, ...M$, of the total Random (vector) signal $| X >$ can be written as

$$X(m) = N(m) + \sum_{i=1}^{K} A_i s^{(i)}(m)$$

The covariance matrix Γ_N of $| N >$ is $\sigma^2 I$, where I is a unit matrix. Calculate the covariance matrix Γ_X of $| X >$.
(b) In the above problem, assuming that the vectors $| s^{(i)} >$ are orthogonal, 10
find the eigenvectors of Γ_X.

Q. 3. (a) What are (i) Poisson Process (ii) Poisson points and (iii) Shot Noise. 10
Define the random signal $X(t)$ for all three cases. Find the probabilty for the Poisson Process signal $X(t) = n$ and find its correllation function.
(b) Show that the probability density function for the random variable 10

$$y = \sum_{i=1}^{N} c_i x_i$$

where x_i are zero-mean, independent, real normal random variables with variance σ_i^2 respectively and c_i are real constants is also a gaussian with variance $c_i^2 \sigma_i^2$.

Q. 4. (a) The random walk of a particle is charaterised by the variable .10

$$X_n = \sum_{k=1}^{n} x_k$$

where x_i are random steps of equal length, taking the value $+1$ with a probability p and -1 with a probability $q = 1 - p$. What is the average value of X_n and its variance? Show that for large value of n, the particle's current position X_n is a Gaussian.

(b) Find the probability of (i) the particle returning to the starting position 10
after n steps and (ii) the particle returning to the starting position for the first time after n steps

Q. 5. (a) Show that the error between a random variable Y and its Linear Minimum Mean Square Error Estimate (LMMSEE) $\hat{Y}$, in terms of the random variables $X_1, X_2, X_3, ...X_n$ is orthogonal to each of the variables $X_1, X_2, X_3, ...X_n$. 10

(b) A stationary random signal $s(t)$ is corrupted by two additive stationary noise $\nu_1(t)$ and $\nu_2(t)$ with power spectra $\Phi_1(\omega)$ and $\Phi_2(\omega)$. Show that the power spectrum $H(\omega)$ of optimum Wiener filter to remove the noise components is given by 10

$$H(\omega) = \frac{\Phi_s(\omega)}{\Phi_s(\omega) + \Phi_1(\omega) + \Phi_2(\omega)}$$

$\Phi_s(\omega)$ is the power spectrum of the signal $s(t)$.

Q. 6. Three dice, with faces numbered 1,2,3,4,5 and 6 are rolled togeather. What are the basic events and their total number? What is the sample space? Assigning equal probability to all the basic events calculate the probability for (1) sum of three numbers to be 12 and (2) Product of three numbers is 24. 20

Q. 7. (a) Show that the number of calls, n originating from a telephone exchange in an interval of time $(0, t)$ follows Poisson distribution. 10

(b) If a random signal $X(t)$ is defined in the above problem, such that $X(t) = n$ find the correlation function $R(t_1, t_2)$. 10

Distributed operating System (2) 8/12/09

M.E -II Sem - Comp (12)

Con. 5433-07. **BB- 7455**

(3 Hours) **[Total Marks : 100**

N. B. : (1) Q. No. 1 is **compulsory.**
(2) Attempt any **four** out of remaining **six** questions.

Q1.a What are the different issues in the design of a distributed Operating system. **10**

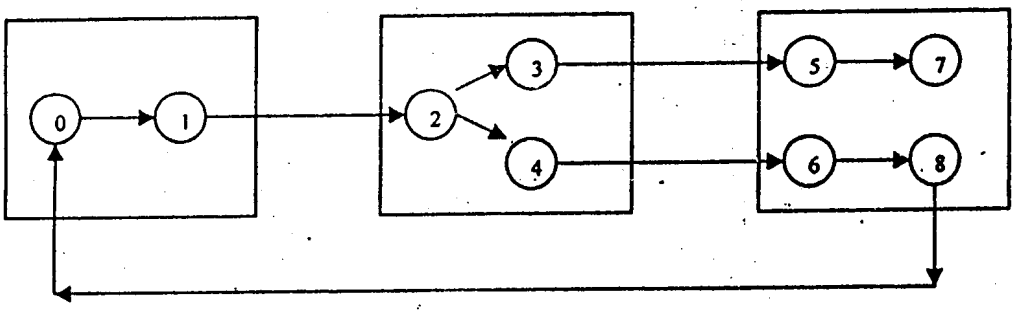
Q1.b. What are the necessary and sufficient conditions for mutual exclusion? How is mutual exclusion achieved using semaphores? **10**

Q2.a Explain Ricart-Agarwala's algorithm for mutual exclusion. How does the algorithm behave when a process has crashed and does not respond to a request from another process to enter the critical region? How could crashed processes be detected? Discuss. **14**

Q2.b. Process P2 needs resource R1 which is held by process P1. Process P2 has a transaction time-stamp of 50 and P1 has a transaction time-stamp of 100. What happens in: **6**

a. wait-die
b. wound-wait

Q3. a Show the probe messages in this resource graph for Chandy Misra Haas algorithm. Is the system in deadlock? Why? How does one recover from deadlock detected in a distributed system? **10**



[TURN OVER

Q3b . What are the design issues for processor allocation algorithms? Explain one centralized algorithm for the same **10**

Q4.a. State in brief what happens if:

i. 2 processes detect the demise of a co-ordinator simultaneously and both decide to hold election using the bully algorithm. **06**

ii. During an RPC communication

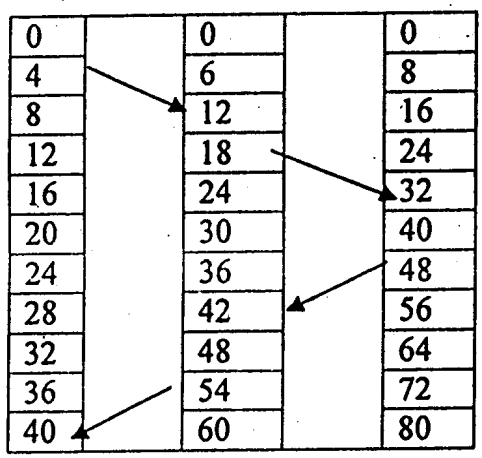
i. Reply message from server to client is lost **06**

ii. Client crashes after sending a request to server

Q4. b. Differentiate between: **08**

i) Statefull and stateless servers. ii) Distributed OS and networked OS.

Q5. a What is the need for clock synchronization in distributed systems? Three processes with on different machines with different clocks are shown sending messages to each other. Apply Lamport's algorithm and give the synchronized diagram. **10**



Q5. b. Discuss different dynamic scheduling algorithms for real-time systems. **10**

Q6. a. Discuss the UNIX i-node structure. Convert virtual address 340,000 to (block no, offset) pair for a block of size 1K. **10**

b. Discuss the following with examples:

i) System calls in Unix

ii) Structure of Buffer cache header in UNIX **10**

Q7. Write short notes on (any two): **20**

i) Replication in Distributed File systems

ii) Sun's NFS.

iii) Hard and soft real-time systems

ME (comp) Sem II
A.T.K.T

Date 13/12/2007

(13)

882 : 2ndHf-J

Con. 5542-07. **BB-7458**

Advanced Database Management Systems

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** out of remaining.
(3) Assume **suitable** data if **necessary** and **justify** the assumptions.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) Consider the relation R {A, B, C, D, E, F, G, H, I, J} and the set F of functional dependencies **9**
F = { {A, B} → C, A → {D, E}, B → F, F → {G, H}, D → {I, J} }
   (i) Evaluate each of the following as a candidate key for R, giving reasons why it can or cannot be a key : {A}, {A, B}, {A, B, F}
   (ii) Based on the above key determination, state whether the relation R is in 3NF and in BCNF giving proper reasons.
   (iii) Consider the decomposition of R into R1(A, B, C, D, E, F), R2(F, G, H, I, J). Is this decomposition loss less ? Show why.

(b) Explain 4NF and 5NF with example. **6**

(c) Define 3NF and BCNF. **5**

2. (a) How can you include the method signature into each class of the object oriented Database schema ? **10**

(b) Draw the serializable graphs for the schedules S_1 and S_2, and state whether each schedule is conflict serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s). **5**
   S_1 : $r_1(X)$; $r_2(Z)$; $r_1(Z)$. $r_3(X)$; $r_3(Y)$; $w_1(X)$; $w_3(Y)$; $r_2(Y)$; $w_2(Z)$; $w_2(Y)$;
   S_2 : $r_1(X)$; $r_2(Z)$; $r_3(X)$; $r_1(Z)$; $r_2(Y)$; $r_3(Y)$; $w_1(X)$; $w_2(Z)$; $w_3(Y)$; $w_2(Y)$.

(c) For the schedules given in Q. No. 2. (b) determine whether each schedule is view serializable or not.. If a schedule is serializable, write down the equivalent serial schedule(s). **5**

3. (a) How do optimistic concurrency control techniques differ from other concurrency control techniques ? Why are they also called validation are certification techniques ? Discuss the typical phases of an optimistic concurrency control method. **10**

(b) Explain with example ARIES recovery procedure. **10**

4. Consider university database that keeps track of students and their majors, transcripts and registration and university's courses. Several sections of each course are offered and each section is related to the instructor who is teaching. It also keeps track of the sponsored research projects of faculty and graduate students of the academic departments of the particular college. The database also keeps track of research grants and contracts awarded to the university. A grant related to one principle investigator and to all researchers it supports.

(a) Design Object Oriented Database Schema. **15**

(b) Answer the following queries in Object Query Language :— **5**
   (i) Retrieve the names of all students who completed the course called "ADBMS".
   (ii) Retrieve the top three computer science majors based on gpa.

6. XML document of 'Restaurant Menu Card' has food items, categorized into Starters, Drinks, Chinese, South and Punjabi. Each food item element contains name, cost, calories, and veg/non-veg flag.

(a) Write DTD rules for above XML document. 7

(b) Write XML Schema for above XML document. 8

(c) Write X-Path to refer "South" food items and X-Query to retrieve all veg food items having cost above Rs. 1000/-. 5

20

7. Write short notes on any **four** of the following :—

(a) Data warehousing

(b) GIS applications

(c) Data Mining Steps

(d) Temporal Database

(e) Multimedia data model

(f) Deductive Database with respect to need, optimization.

ME (sem-II) KT Computer
Advances in Managmt Information

18/12/2007

v076

on/5740–07.

(REVISED COURSE)
(3 Hours)

(14)

BB–7464
[Total Marks : 100

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions out of the remaining.

Q.1 (a) Explain systems approach to problem solving. 08
(b) Explain the operations and management classifications of information systems. 06
(c) Explain the information system resources and activities to collect, transform and disseminate information in an organization. 06

Q.2 (a) Explain Executive Information System in detail. 10
(b) Differentiate between internet and intranet. Explain some benefits and limitations of intranet. 10

Q.3 (a) Differentiate between DSS and MIS. 10
(b) What is e-commerce? Explain the three basic categories of e-commerce with examples. 10

Q.4 (a) Explain Customer Relationship Management and Supply Chain Management. Can these be integrated? If yes, then how? 10
(b) Explain the Transaction Processing cycle in detail. 10

Q.5 (a) Differentiate between OLTP and OLAP. 10
(b) Explain Enterprise Resource Planning in detail. 10

Q.6 (a) What is business process reengineering? What are the steps required to make it effective? 10
(b) What are the four most important factors used in evaluating computer software? Explain why? 10

Q.7 Write notes on **any two** of the following : 20
(i) Data Warehousing
(ii) m-commerce
(ii) Reusability in prototyping
(iii) DSS

ME (Comp) sem-II A.T. K.T

Date 22/12/2017

5812-07.

BB-7467

Image Processing (15)

(3 Hours)

[Total Marks : 100

1) Question No. 1 is Compulsory.
2) Attempt any four of remaining six questions.
3) Assume any suitable data if necessary and clearly state it.
4) Figures to right indicates full marks

Q 1) Justify the following statement. 20
a) Discrete Cosine Transform is energy preserving transform
b) Orthogonal Transforms are useful tool for image processing.
c) Walsh and Hadamard Transform are used for data compression ,where low computing resources are available.
d) The mean filter is a linear filter but median filter in not.

Q. 2 a) Explain fundamental steps in Digital Image Processing. 10
b) Explain with suitable example different distance measures. 10

Q.3) a) Explain in detail Filtering in the Frequency Domain. 10
b) Gray level histogram of an image is given below 10

level	0	1	2	3	4	5	6	7
uency	400	700	1350	2500	3000	1500	550	0

Compute the gray level histogram of the output image obtained by enhancing the input by the histogram equalization technique.

Q. 4) a) Find the set of code words and average word length using Huffman coding scheme for the set of input gray levels with probabilities as given below 10

t	S1	S2	S3	S4	S5	S6	S7	S8
ability	0.02	0.15	0.03	0.15	0.05	0.20	0.10	0.30

pute the lowest possible average bits per gray level required to represent this data.

b)Explain in detail subjective and objective fidelity criteria for decompressed image assessment. 10

5) a) Explain in detail a general compression system model. 10

b) Describe the region growing technique for image segmentation and mention the problems associated with it. 10

6) a) What is Edge Linking? Explain in detail how Hough Transform is used for Edge Linking. 10

b) Discuss in detail various Line Detection algorithms. 10

7) Write a Short Notes on (Any Four) 20

a) Image Restoration
b) Uniform and Non-Uniform Sampling
c) Homomorphic Filtering.
d) Wiener Filter
e) Erosion and Dilation Operations
