P846

[3834] - 41

M.C.A. - II (Science Faculty)

COMPUTER SCIENCE

CS - 401: Graphics

(Sem. - IV) (Old)

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

Instructions to the candidates:

   1)   ***Neat diagrams must be drawn wherever necessary.***

   2)   ***All questions are compulsory.***

Q1) Attempt any Two of the following.   **[2 × 5 = 10]**

   a)   Compare parallel and perspective projection.

   b)   Explain Bresenham's circle drawing algorithm.

   c)   Apply the shearing transformation to rectangle with A (0,0), B (5,0), C (5,2), D (0,2) as given below.

       i)   Shear the parameter value of 0.5 relative to the line Xref = -1

       ii)   Shear the parameter value of 1 relative to the line Yref = -1

Q2) Attempt any Four of the following.   **[4 × 5 = 20]**

   a)   What is aliasing? Explain different methods of minimizing its effect.

   b)   Explain Sutherland & Cohen subdivision Line clipping algorithm.

   c)   Explain advantages of GIF file format.

   d)   Show that a transformation matrix for a reflection about a line y = x is equivalent to reflection through x - axis followed by counter clockwise rotation of 90°.

   e)   Explain Gouraud shading algorithm.

Q3) Attempt any Four of the following. [4 × 5 = 20]

    a) Explain Image Transformation.

    b) Explain depth sort algorithm.

    c) Write a short note on Light pen.

    d) Explain three dimensional clipping.

    e) Find out final co-ordinates of a figure bounded by the co-ordinates (1,1), (3,4), (5,7), (10, 3) when rotated about a point (8,8) by 30° in a clockwise direction & scaled by 2-units in x - direction and 3 - units in y - direction.

Q4) Attempt any Four of the following. [4 × 5 = 20]

    a) Find the normalization transformation window to viewport window , lower left corner at (1,1) & upper right corner at (3,5) onto a view port, for entire normalized deviced screen.

    b) What are the properties of B - spline curve.

    c) Explain stroke method of character generation.

    d) Compare plasma display & raster scan DVST.

    e) Explain HSV color model.

Q5) Attempt any Five terms: [5 × 2 =10]

    a) Resolution.

    b) Half toning.

    c) Windowing.

    d) Clipping.

    e) Aspect ratio.

    f) Interpolation.

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P866

[3834] - 501

M.C.A. (Science Faculty)

CS - 501: Cryptography and Network Security

(Sem. - V) (New - 2008 Pattern)

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 are compulsory.

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

    a)   Write down the phases that a virus goes through during its lifetime.

    b)   What are the problems in Clear Text Passwords?

    c)   Which parties are involved in KERBEROS Protocol?

    d)   What are the characteristics of Firewall?

    e)   Define: Interior Router and Exterior Router.

    f)   List the contents of Digital Certificates.

    g)   List the strengths of MD5.

    h)   Consider the following Plain Text

         "MCA SCIENCE UNIVERSITY OF PUNE"

         The key to encrypt the text is an alphabet 4 places down the line. Using Caeser Cipher construct Cipher text.

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

    a)   Explain in brief principle of security.

    b)   Explain the following concepts in detail

         i)   Phishing.

         ii)   Pharming (DNS Spoofing).

    c)   What is Stagenography? What are the uses of Stagenography?

    d)   What are the different algorithm modes? Explain in brief.

    e)   Explain the conceptual working of DES. Explain the process of 56 bit key generation in DES.

P.T.O.

Q3) Attempt any Four of the following. [4 × 4 = 16]
   a)   Explain Double DES encryption and Double DES decryption.
   b)   Explain the following.
        i)   Public key cryptography.
        ii)   Man - in - the - middle attack.
   c)   How subkey is generated n RC5?
   d)   What are the problems of Diffie - Hellman Key exchange algorithm?
   e)   Write a short note on Digital signature.

Q4) Attempt any Four of the following. [4 × 4 = 16]
   a)   Explain in short.
        i)   Cross Certification.
        ii)   Certificate Revocation List.
   b)   Explain the working of Certificate based Authentication.
   c)   What is firewall? What are the types of firewall?
   d)   Explain Handshake Protocol in brief.
   e)   Write a short note on Secure Electronic Transaction (SET) process.

Q5) Attempt any Four of the following. [4 × 4 = 16]
   a)   Consider the plain text.
        "MCA"
        Using Hill Cipher construct the cipher text. Let the key matrix be

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

   b)   Consider the plain text
        "MCA SEMESTER FIVE"
        One time pad is QACDZMOUXGIJNVB
        Using Vernam Cipher construct the cipher text.
   c)   Apply PlayFair technique and convert the following plain text into cipher text. Plain text: UNIVERSITY OF PUNE.
   d)   Consider the values of $n = 17$ and $g = 13$. Apply Diffie - Hellman Algorithm and generate keys K_1 and K_2.
   e)   Consider the plain text "10". Let $P = 7$ and $Q = 17$. Construct the cipher text using RSA algorithm and also decrypt the cipher text you have constructed to get the original plain text.

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P867

M.C.A. (Science Faculty)
CS - 502: INTERNET PROGRAMMING USING PHP
(New Syllabus) (Sem. - V) (2008 Pattern)

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

Instructions to the candidates:

　　1)　　*Neat diagrams must be drawn wherever necessary.*

　　2)　　*All questions are compulsory.*

　　3)　　*Figures to the right indicate full marks.*

　　4)　　*All questions carry equal marks.*

　　5)　　*Assume suitable data, if necessary.*

Q1) Attempt ALL: **[8 × 2 = 16]**

　　a)　　What are the limitations of cookies?

　　b)　　Explain in brief, any two ways of defining string constants in PHP.

　　c)　　What is type juggling?

　　d)　　Write one similarity and one difference between associative and indexed arrays.

　　e)　　How to remove leading and trailing spaces of the string?

　　f)　　What do you mean by $ _ POST array?

　　g)　　What do you mean by JSON?

　　h)　　Why is XML important?

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

　　a)　　What are the different functions for parsing in XML?

　　b)　　Write a note on sticky form with suitable example.

　　c)　　What are the different ways provided by PHP to sort an array?

　　d)　　Explain different types of regular expressions supported by PHP.

　　e)　　Explain serialization in PHP with suitable example.

P.T.O.

Q3) Attempt any Four: **[4 × 4 = 16]**

    a) Write a PHP script to accept user name and password , if in first 3 attempts, user name and password is correct, then display second form , else display error message.

    b) Write a PHP script to accept directory name from the user and display all files in it with their size in tabular format.

    c) Write a PHP script to count number of times given element occur in an array.

    d) Write a PHP script which creates a base class which stores 2 numbers as properties and defines a method $calc()$ which prints the numbers to the browser.

    e) Write a PHP script to accept a string, tokenize by comma, and print each token on a new line.

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

    a) How to receive an email from a PHP script?

    b) How HTTP protocol works? Explain.

    c) How to carry - data from page to page? Explain.

    d) What are the different library functions, provided by PHP, to work with sessions?

    e) Explain do - while and foreach control structures with syntax.

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

    a) Explain any Four global arrays that contain the EGPCS information.

    b) How security is achieved in PHP while handling uploaded files?

    c) Explain how to use JSON in AJAX?

    d) What are well - formed and valid documents in XML? Explain.

    e) Explain in detail, variable parameter function in PHP with suitable example.

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P868

[3834] - 503

M.C.A. (Science Faculty)

COMPUTER SCIENCE

CS - 503: Design Pattern

(Sem. - V) (2008 Pattern)

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 the following.   **[8 × 2 = 16]**

   a)   Define Pipe and Filter Architectural Pattern.

   b)   What do you mean by Tee and Join Pipeline system?

   c)   What are the elements of a Design Pattern?

   d)   Give intent of Prototype Design Pattern.

   e)   What is a intent of Decorator Design Pattern?

   f)   State Collaboration of a strategy Design Pattern.

   g)   "Idioms are highly portable between programming languages" Justify.

   h)   What is an Idioms?

Q2) Attempt the following. (Any four)   **[4 × 4 = 16]**

   a)   What is a pattern? What are a pattern categories?

   b)   Illustrate steps to describe a stepwise refinement approach for layered Architectural Pattern.

   c)   Discuss consequences of Black board Architectural Pattern.

   d)   Explain the steps to implement Broker Architectural Pattern.

   e)   What are consequences of model. View - controller Architectural Pattern?

P.T.O.

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

    a)   How the catalog of Design Pattern is organized?

    b)   Give structure and Participants of a Abstract Factory Design Pattern.

    c)   What are benefits and liabilities of a Abstract factory Design Pattern?

    d)   State applicability of prototype Design Pattern.

    e)   Illustrate structure, participants, and collaboration of singleton Design Pattern.

Q4) Attempt the following. (Any four)   **[4 × 4 = 16]**

    a)   Give structure and participants of a Adapter Design pattern.

    b)   What are the implementation approaches for narrow interface in Adapter Design Pattern?

    c)   How to use Decorator Design Pattern? What are the known uses of it?

    d)   Explain structure and participants of proxy Design Pattern.

    e)   State and explain consequences of command Design pattern.

Q5) Attempt the following. (Any four)   **[4 × 4 = 16]**

    a)   In detail, give collaboration of a observer design pattern.

    b)   Explain observer Design Pattern with the help of structure and Participants.

    c)   What are the benefits and draw backs of strategy Design Pattern?

    d)   Explain Indented control Flow style guide Idiom.

    e)   Write a short note on counted pointer Idiom.

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P869

[3834] - 504

M.C.A. III (Science Faculty)
COMPUTER SCIENCE
CS - 505: Software Testing and Quality Assurance
(Sem. - V)

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 Alpha & Beta testing.

   b)   Define term "measures" with example.

   c)   What is driver?

   d)   Define Stub.

   e)   Explain Unit testing.

   f)   Define process capability Indices.

   g)   What is pareto analysis?

   h)   Write different testing tools.

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

   a)   Explain Complexity metrices.

   b)   Explain concept of six - sigma quality.

   c)   What is Regression testing? Explain with example.

   d)   Explain black box testing techniques.

   e)   List and explain the four major categories of quality cost. Give example of each.

P.T.O.

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

    a)   Define population & a sample. What are their major characteristics?

    b)   Explain testing process in detail.

    c)   Explain the nature of errors.

    d)   Differentiate between top down & bottom up approach in an Integration testing.

    e)   Determine the cyclomatic complexity for the following flow graph.
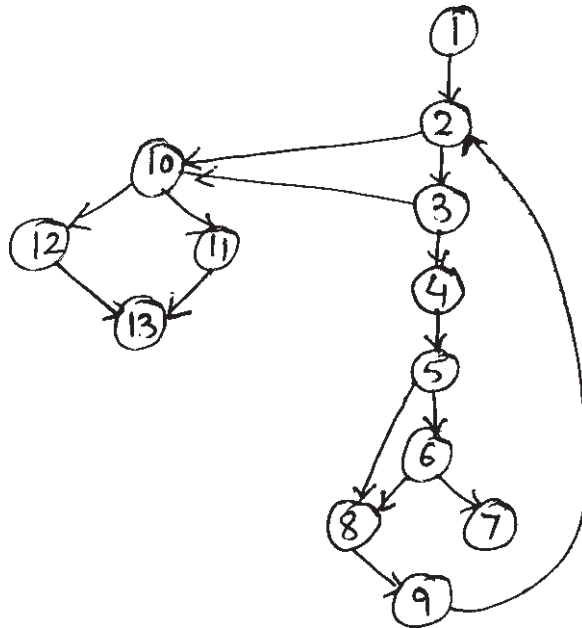
Q4) Attempt <u>any four</u> of the following. [4 × 4 = 16]

    a)   What is SQA plan?

    b)   Explain Branch coverage criterion in white box testing.

    c)   Write steps for constructing cause and effect diagram.

    d)   Explain Testing Documentation & Testing for Real time system.

    e)   Comment "Business success critically depends on good information management".

Q5) Attempt <u>any four</u> of the following [4 × 4 = 16]
Write a short note on

    a)   Brain stroming.

    b)   Testing GUI.

    c)   Sampling theory & Distribution.

    d)   Size oriented metrices.

    e)   Winrunner & Rational Robot.

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P842

[3834]-31

M.C.A. - II (Under Science Faculty)
COMPUTER SCIENCE
CS - 301 : Design and Analysis of Algorithms
(Old Course) (Sem. - III)

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

Instructions to the candidates:

    1)   *All questions are compulsory.*

    2)   *Figures to the right indicate full marks.*

    3)   *Assume suitable data, if necessary.*

    4)   *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt any four of the following :   **[4 × 5 = 20]**

    a)   Show that $n^{3/2} = \mathrm{o}\,(4n^2)$.

    b)   Rank following function in their increasing order of growth rates :

         $\log_2 n$, n, $n \log_2 n$, n^2, n^3, 2^n.

    c)   Solve following example of fractional Knapsack using greedy method.

         p = (12, 6, 15, 7, 6, 20, 3)

         w = (2, 3, 5, 7, 2, 5, 1) m = 15

    d)   Find optimal binary merge pattern for *n* files whose lengths are :

         li = (20, 30, 10, 5, 30) using binary merge tree.

   e)   Explain all methods or techniques to represent the graph in memory. Explain any one techniques in detail.

Q2) Attempt any six of the following :   **[6 × 8 = 48]**

    a)   Explain Heap sort algorithm, and using heap sort the following data.

         15, 5, 20, 150, 1, 6, 7, 55, 68.

    b)   Obtain sequence of jobs such that profit is maximized and many jobs can be finished

   p = (3, 5, 20, 18, 1, 6, 30)

         d = (1, 2, 4, 3, 2, 1, 2)

c) What is difference between D.F.S and B.F.S. draw the D.F.S. and B.F.S. paths for given graph using algorithm.
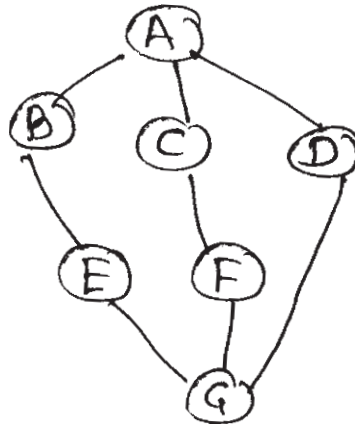
d) Solve the following example of T.S.P. using Branch and Bound method.

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

e) 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.
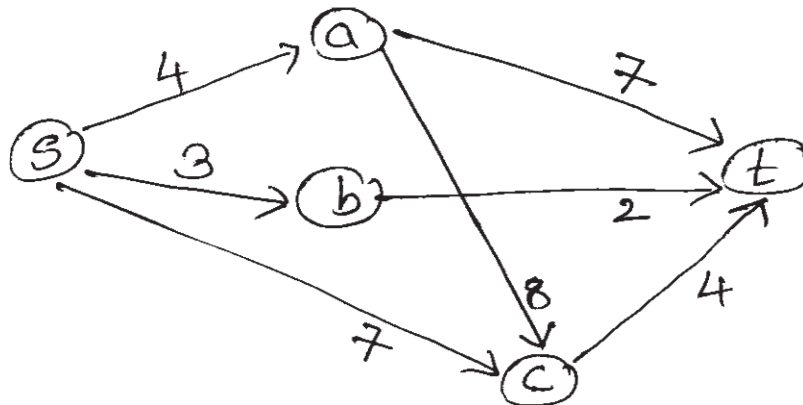
f) What is means by Articulation Point write the steps to find articulation point and find the articulation points for the following graph.
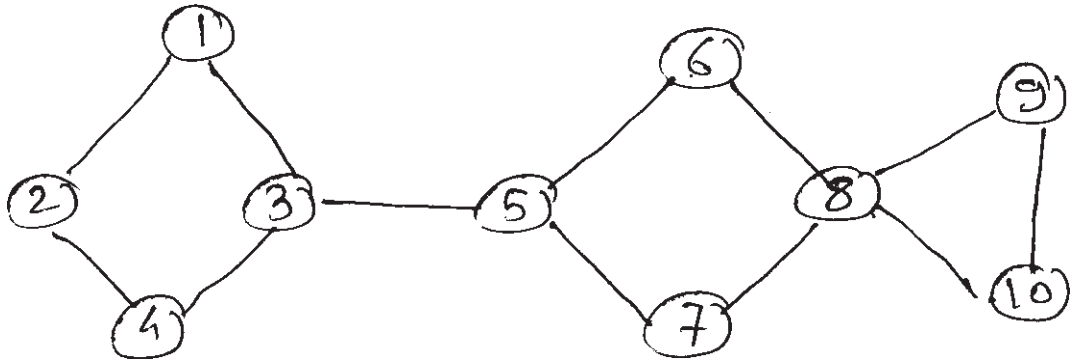

g) Given set S of weights as w = {5, 20, 10, 15, 5} $n = 5$ and $m = 25$. Apply backtracking to find all possible subsets of S that gives the sum of elements as 25.

h) Explain matrix-chain multiplication problem and find an optimal paranthesization of a matrix-chain product whose sequence of dimensions is (30, 35, 15, 5, 10, 20, 25).

Q3) Attempt any three of the following :   **[3 × 4 = 12]**

a) Diagramatically represent the 8 Queens problem and give explicit and implicit constraints.

b) Apply Backtracking method on the following instance of graph coloring problem of 5 nodes and 3 colors. Find an solutions.
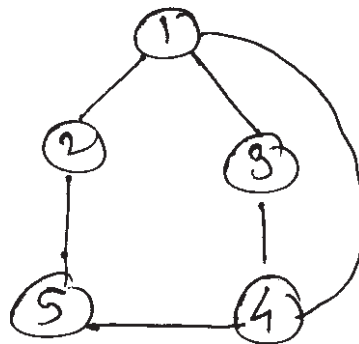
c) Write note on satisfiability problem.

d) Show the relationship between P,NP, NP-Hard and NP-complete problems with defination.

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P847

[3834]-42

M.C.A. (Under Science Faculty) - II
COMPUTER SCIENCE
CS - 402 : Artificial Intelligence
(Old) (Sem. - IV)

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

   a) Discuss different levels of knowledge representation.

   b) Explain different symbols and rules of combination permitted in FOPL.

   c) Why one want to model human performance to different task?

   d) Write a short note on 'Branch and Bound' search technique.

   e) Define the following terms :

   i) Objects.
   ii) Messages.
   iii) Classes.
   iv) Methods.

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

   a) Write a LISP function without recursion to find factorial of given no.

   b) Explain do statement in LISP.

   c) Write a LISP function to find addition of first N numbers using recursion.

   d) Write a PROLOG program to find reverse of given list.

   e) Write a PROLOG program to list all students who does not live in "Pune". (consider students information contains fields such as roll no, name, class, city).

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

   a)   Explain any four primitives used in LISP.

   b)   How PROLOG differ from high level languages.

   c)   Write a short note on inference rules in FOPL.

   d)   Write a short note on conceptual dependency.

   e)   Construct the conceptual graph equivalent to the sentence :

       "John is eating rice with a spoon".

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

   a)   Write a short note on AO* Algorithm.

   b)   Explain all steps needed to convert a W.f.f to clause form.

   c)   Write best-first-search algorithm and draw stepwise tree generation by expanding each next state until a goal state is reached. (Goal state is designated with∗)
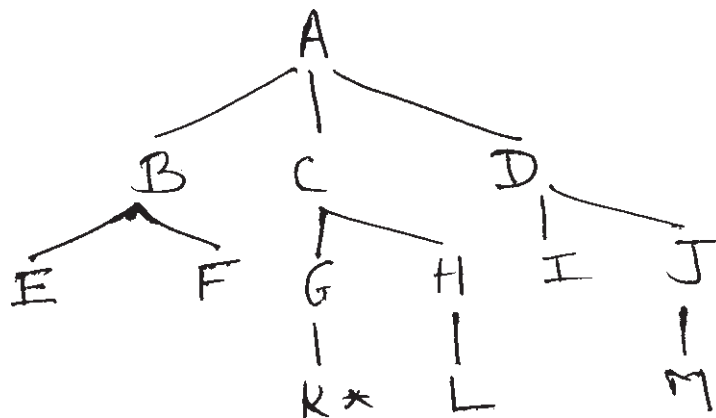
Q5) Attempt <u>any two</u> of the following :   [2 × 8 = 16]

   a)   Create a movie script from the viewpoint of movie-goer.

   b)   Construct partitioned semantic net representations for the following :

       i)   Every Batter hit a ball.
       ii)   All the batters like the pitcher.

   c)   Explain general frame structure. Give a suitable example.

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P848

[3834]-43

M.C.A. (Under Science Faculty)
COMPUTER SCIENCE
CS - 403 : Advance Database Management System
(2005 Pattern) (Old) (Sem. - IV)

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)   *Assume suitable data, if necessary.*
  4)   *All questions are compulsory.*

Q1) Attempt the following :   **[1 × 20 = 20]**

Consider the following BCNF relational schema for a portion of a university database.

Prof (ssno, pname, office, age, sex, speciality, dept_did)

Dept (did, dname, budget, num-majors, chair_ssno)

Suppose you know that the following queries are the five most common queries in the workload for this university and that all five are roughly equivalent in frequency and importance :

1.   List the names, ages, and offices of professors of a user-specified sex who have a user-specified research speciality. Assume that the university has a diverse set of faculty members, making it very uncommon for more than a few professors to have the same research speciality.

2.   List all the department information for departments with professors in a user-specified age range.

3.   List the department id, department name, and chairperson name for departments with a user-specified number of majors.

4.   List the lowest budget for a department in the university.

5.   List all the information about professors who are department chairpersons.

a)   These queries occur much more frequently than updates, so you should build whatever indexes you need to speed up these queries, given this information, design a physical schema for the university database that will give good performance for the expected workload.

P.T.O.

b) Redesign the physical schema, assuming that the set of important queries is changed to the following :

    i)   List the number of different specialities covered by professors in each department, by department.

    ii)   Find the department with the fewest majors.

    iii) Find the youngest professor who is a department chairperson.

Q2) State true/false and justify the following (any five) :   **[5 × 2 = 10]**

a) Including DISTINCT in the SELECT clause can not be costly.

b) Setting a latch before reading or writing a page ensures that the physical read or write operation is atomic.

c) The log entries describing a change to the database are written to stable storage after the change is made.

d) Fragmentation consists of breaking a relation into smaller relations.

e) Using an oid to refer to an object is same as a using a foreign key to refer to a tuple in another relation.

f) In data warehouse, loading data consists of materializing views and storing them in the warehouse.

g) An algorithm is scalable if the running time grows is proportion to the dataset size, holding the available system resources constant.

Q3) Attempt the following (any five) :   **[5 × 2 = 10]**

a) What do you mean by vertical partitioning of BCNF relations?

b) What is index locking?

c) What are the tasks perform in Analysis Phase of ARIES?

d) What are the types of distributed databases?

e) Describe the storage and access methods in ORDBMS.

f) Draw a diagram of Typical Data Warehouse Architecture.

g) What are the steps of KDD process.

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

a) For each of the following queries, identify one possible reason why an optimizer might not find a good plan. Rewrite the query so that a good plan is likely to be found.

i) An index is available on the age attribute

SELECT E.dno

FROM Employee E

WHERE 2* E.age < 20

ii) No index is available

SELECT DISTINCT*

FROM Employee E.

b) Consider a database with objects X and Y and assume that there are two transactions T_1 and T_2. Transaction T_1 reads objects X and Y and then writes object X. Transaction T_2 reads object X and Y and then writes object X and Y.

i) Give an example schedule with actions of transaction T_1 and T_2 on objects X and Y that results in a write-read conflict.

ii) Give an example schedule with actions of transactions T_1 and T_2 on objects X and Y that results in a read-write conflict.

iii) Give an example schedule with actions of transactions T_1 and T_2 on objects X and Y that results in a write-write conflict.

iv) For each of the three schedules, show that strict 2 PL disallows the schedule.

c) Consider the following classes of schedules : serializable, conflict-serializable, view-serializable, recoverable, avoids-cascading-aborts, and strict. For each of the following schedule, state which of the preceding classes it belongs to. If you cannot decide whether a schedule belongs in a certain class based on the listed actions, explain briefly.

i) $T_1 : R (X), T_2 : R (Y), T_3 : W (X), T_2 : R (X), T_1 : R (Y)$

ii) $T_1 : R (X), T_1 : R (Y), T_1 : W (X), T_2 : R (Y), T_3 : W (Y), T_1 : W (X), T_2 : R (Y)$.

d) Consider the execution shown in following figure.

LSN	LOG
00	Update : T_1 writes P_2
10	Update : T_1 writes P_1
20	Update : T_2 writes P_5
30	Update : T_3 writes P_3
40	T_3 commit
50	Update : T_2 writes P_5
60	Update : T_2 writes P_3
70	T_2 abort.

i) Extend the figure to show prev LSN and undo next LSN values.

ii) Describe the actions taken to rollback transaction T_2.

iii) Show the log after T_2 is rolled back, including all prev LSN and undonext LSN values in log records.

e) Consider the following sequences of actions, listed in the order they are submitted to the DBMS.

Sequence S1 : T_1 : R (X), T_2 : W (X), T_2 : W (Y), T_3 : W (Y)
T_1 : W (Y), T_1 : commit, T_2 : commit, T_3 : commit
Sequence S2 : T_1 : R (X), T_2 : W (Y), T_2 : W (X), T_3 : W (Y),
T_1 : W (Y), T_1 : commit, T_2 : commit, T_3 : commit

For each sequence and for each of the following concurrency control mechanisms, describe how the concurrency control mechanism handles the sequence. Assume that the timestamp of transaction Ti is i.

i) Conservative 2 PL.

ii) Optimistic concurrency control.

Q5) Attempt the following (any four) : [4 × 5 = 20]

a) Write a short note on Query Benchmarks.

b) In detail, explain optimistic concurrency control.

c) What is a log? What are the actions written in log? What do you mean by LSN?

d) With the help of diagram, explain architectures for parallel databases.

e) Describe the functionality issues and efficiency issues in DRDBMS Query Processing.

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P849

[3834]-44

M.C.A. (Under Science Faculty)
COMPUTER SCIENCE

CS - 405 : Management Information System and Decision Support System
(2005 Pattern) (Old) (Sem. - IV)

Time : 3 Hours]   *[Max. Marks : 80*
Instructions to the candidates:
   1)   Figures to the right indicate full marks.
   2)   All questions carry equal marks.

Q1) Attempt the following (any four) :   **[4 × 4 = 16]**

   a)   What do you mean by system stress?

   b)   What is the value of information in decision making?

   c)   Explain subsystems of MIS.

   d)   Explain the concept of planning according to various levels of management.

   e)   What are the characteristics of human information processing performance?

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

   a)   Explain prototyping life cycle approach for MIS design.

   b)   Explain Information system for operational control.

   c)   How to improve the quality of decision making.

   d)   Explain the support of computer in decision making.

   e)   Discuss the characteristics and benefits of EIS.

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

   a)   Open system Vs. closed system.

   b)   Data processing Vs. Information Processing.

   c)   MIS Vs. data processing.

   d)   Decoupling Vs. decomposition.

   e)   Short term memory Vs. long term memory.

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

    a)   What is information system for management control?

    b)   Explain information system for strategic planning.

    c)   What is the role of DSS in MIS?

    d)   How can DSS support decision making under stress.

    e)   Explain the needs of EIS.

Q5) Write a short note on (any four) :   [4 × 4 = 16]

    a)   General Model of a System.

    b)   Utility of Information.

    c)   MIS Design Approaches.

    d)   Law of Requisite Variety.

    e)   Limitations of Human Information Processing.

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P850

[3834]-101

M.C.A. (Under Science Faculty)
COMPUTER SCIENCE
CS - 101 : 'C' Programming
(2008 Pattern) (New) (Sem. - I)

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)　Assume suitable data, if necessary.
　　4)　All questions are compulsory.

Q1) A)　Trace the output (any two) :　　　　　　　　　**[2 × 4 = 8]**

　　　　a)　main ( )
　　　　　　{　int $x = 1$;
　　　　　　　　switch (x);
　　　　　　　　{
　　　　　　　　case 0 : $x = 1$;
　　　　　　　　case 1 : $x = 3$;
　　　　　　　　case 2 : $x + = 4$;
　　　　　　　　case 3 : $x = 2$;
　　　　　　　　default : $x + = 2$;
　　　　　　　　}
　　　　　　　　printf ("%d", x);
　　　　　　}

　　　　b)　main ( )
　　　　　　{
　　　　　　　　int b [ ] = {10, 20, 30, 40, 50};
　　　　　　　　int i, *K;
　　　　　　　　k = & b [4] – 4;
　　　　　　　　for (i = 0; i < = 4; i + +)
　　　　　　　　{
　　　　　　　　printf ("%d\t", *K);
　　　　　　　　k + +;
　　　　　　　　}
　　　　　　}

c) Static int i = 100;
   main ( )
   {
           static int i = 200;
           abc ( );
           printf ("%d", i);
   }
           abc ( )
   {
           printf ("% d|t", i);
   }

B) Find out error and explain.   [2 × 4 = 8]
   a) main ( )
      {
              int *c;
              c = check (10, 20);
              printf ("ln c = % u", c);
      }
              check (int i, int j)
      {
              int *p, *q;
              p = & i;
              q = & j;
              if (i > = 45)
                  return (p);
              else
                  return (q);
      }

   b) Struct stud
      {
              int rno;
              char name [20];
      };
              struct stud S1 = {20, "ABCD"};
              struct stud S2 = S1;
              if (S1 = = S2)
                  printf ("equal");
              else
              printf ("unequal");
      }

c) 	# define CUBE (*x* * *x* * *x*)
	main ( )
	{
		int *x*, *y* = 3;
		x = CUBE (*y* + +);
		printf ("%d", *x*);
		printf ("l*n*%.d", *y*);
	}

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

a) Write down the syntax of following functions - getch ( ), getche ( ), getchar ( ). What is the difference between them?

b) Write a short note on working of switch statement.

c) Compare : static memory allocation and dynamic memory allocation.

d) What is local variable and global variable, explain it with the help of example.

e) Explain the following concepts using appropriate example.

	1) Function returning pointer.

	2) Pointer to a function.

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

a) Write a 'c' program to display first 'n' perfect numbers. Accept 'n' from the user.

b) The Ackerman's function is defined as -

	$f(a, b) = f(a - 1, f(a, b - 1))$. $f(1, b) = 2b$, f $(a, 1) = a$ for $a > 1$.

	write a recursive function for above function.

c) Write a 'c' program to accept a decimal number and convert it to equivalent octal number using user defined function.

d) Write a 'c' program to accept a n × n matrix and display row sum and major diagonal sum of the matrix.

e) Write a 'c' program to accept a number from user and check if it is armstrong number or not.

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

a) What is pointer? Comment : multiplication operation of two pointer variables is allowed.

b) i) In case of 2-D array how memory is represented using row major and column major representation? (show physical view).

ii) In 2-D arrays how the address of an element *a* [*i*] [*j*] of r rows and c columns is calculated using row major and column major representation.

c) Write the syntax and use of following functions

i) f printf
ii) f scanf

d) Explain any two compiler control directives.

e) What is self referencial structure explain with example.

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

a) Write a 'c' program using command line argument to accept a number and display sum of digits of a number.

b) Write a 'c' program to read a file "Test.dat" and display number of characters and words from the file.

c) Write a 'c' program to accept and display the information of 'n' books. Book (book no, book name, author, publication, price).

d) Write a menu driven program to accept a string using pointer and write user defined functions for the following menu items.

i) Calculate string length.
ii) Display reverse of string.

e) Write a 'c' program to accept a filename and encrypt the file using (character + 3) scheme and display encrypted file.

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P851

[3834]-102

M.C.A. (Science Faculty)
CS - 102 : COMPUTER ARCHITECTURE
(2008 Pattern) (New) (Sem. - I)

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

Instructions to the candidates:
1) *All questions are compulsory.*
2) *Draw neat diagrams wherever necessary.*
3) *Figures to the right indicate full marks.*

Q1) Attempt any four : **[4 × 4 = 16]**

a) Draw symbols and write truth table of following gates :

i) AND
ii) Ex-OR
iii) NAND
iv) NOT

b) Explain in brief real mode and protected mode in microprocessor.

c) State the full form of EISA bus and state the features of EISA bus.

d) Explain process of four segment instruction pipeline.

e) Compare RISC and CISC processors.

Q2) Attempt any two : **[2 × 8 = 16]**

a) Draw logic diagrams and write truth tables of

i) D flip flop
ii) T flip flop

State applications of each flip flop.

b) Draw block diagram and explain function of any four components of microprocessor.

c) Explain the operation of DMA controller with neat block diagram.

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

a) What is shift register? State different types of shift registers.

b) Compare PCI bus with EISA bus.

c) Draw logic diagram and explain 4bit binary weighted D to A converter.

d) Explain concept of parallel processing with suitable diagram.

e) Explain with neat block diagram register section of 80386 microprocessor.

P.T.O.

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

    a)   Draw and explain 1:4 demultiplexer using logic gates.

    b)   State features of VESA bus.

    c)   Draw block diagram and explain I/O interface.

    d)   Compare synchronous and asynchronous communication techniques.

    e)   What is encoder? Draw logic diagram of decimal to BCD encoder and explain.

Q5) Attempt any two :   **[2 × 8 = 16]**

    a)   Define counter. State different types of counters. Compare synchronous and asynchronous counters.

    b)   Draw logic diagram and explain dual slope A to D converter.

    c)   i)   Explain with suitable example, concept of instruction arithmetic pipelining.

        ii)   State important features of pentium microprocessor.

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P852

[3834]-103

M.C.A. - I (Under Science Faculty)
MATHEMATICS
CS - 103 : Mathematical Foundation
(New) (Sem. - I)

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 <u>any four</u> of the following : **[16]**

a) Let A = {a, b, c}, B = {1, 2}. Does there exist a 1-1 function from set A to set B? Justify.

b) Prove that A − B = A ∩ B^C.

c) Let n be the number of elements in a set A. Prove that number of elements in the power set of A is 2^n.

d) Give an example of a relation which is not a function. Justify your answer.

e) Let ~ be an equivalence relation on a set A. Prove that the equivalence classes forms a partition of the set A.

f) Give an example of a relation which is symmetric but not antisymmetric. Justify your answer.

Q2) Attempt <u>any four</u> of the following : **[16]**

a) Whether the function $f:\left(\dfrac{-\pi}{2}, \dfrac{\pi}{2}\right) \longrightarrow R$, defined as $f(x) = \sin x$, is one-one and on-to? Justify your answer. Also find the range of function f.

b) Let $a, b, c \in$ Z, $a \neq 0$. If a/bc with gcd $(a, b) = 1$, then prove that a/c.

c) Find gcd of 3587 and 1819 and hence express it as a linear combination of 3587 and 1819.

d) Let $a, b, m \in$ Z, $m \neq 0$. If $a \equiv b$ (mod m) then prove that $a^k \equiv b^k$ (mod m) for any $k \in$ N.

e) Find all solutions of $18x \equiv 30$ (mod 42).

f) Find the solution for the following system of congruences.
$x \equiv 5$ (mod 11), $x \equiv 14$ (mod 29) and $x \equiv 15$ (mod 31).

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

a)   Find the quotient and remainder when polynomial $q(x) = x^4 + 3x^3 + 2x + 1$ is divided by the polynomial $p(x) = x^2 + 2x + 4$.

b)   Find all roots of the polynomial $f(x) = x^4 - 17x^2 + 16$.

c)   Find order of the following permutation.

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ 4 & 3 & 7 & 5 & 1 & 2 & 6 & 10 & 8 & 9 \end{pmatrix}$$

d)   Define even permutation and hence determine whether the following permutation is even or odd? Is inverse even permutation?

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ 4 & 3 & 7 & 5 & 1 & 2 & 6 & 10 & 8 & 9 \end{pmatrix}$$

e)   Write a composition table for the set $Z_6 - \{0\} = \{\overline{1}, \overline{2}, \overline{3}, \overline{4}, \overline{5}\}$ with operation multiplication modulo 6 (X_6). Whether X_6 is a binary operation on $Z_6 - \{0\}$? Justify.

f)   Prove that $U(12) = \{\overline{1}, \overline{5}, \overline{7}, \overline{11}\}$ is a group with respect to the operation multiplication modulo 12 (X_{12}).

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

a)   Let G be a group. If $x^2 = e \; \forall \; x \in$ G, then prove that G is abelian.

b)   Find the inverse of the following matrix by adjoint method.

$$A = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \\ 2 & 1 & -3 \end{bmatrix}$$

c)   Solve the following system of equations by using cramer's rule.

$x + 2y + 3z = 14, \; 2x - y + 5z = 15, \; 3x - 2y - 4z = -13$

d)   Give an example of a relation which is reflexive, transitive but not symmetric. Justify.

e)   Define composition of two functions. Also prove that $(fog)^{-1} = (g^{-1}of^{-1})$.

f)   Find remainder when 5^{45} is divided by 7.

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

   a)   Show that p ∨ (q ∧ r) and (p ∨ q) ∧ (p ∨ r) are logically equivalent by using truth table.

   b)   Show that ¬ (p ∨ (¬ p ∧ q)) and ¬ p ∧ ¬ q are logically equivalent by devoloping a series of logical equivalences.

   c)   What is the truth value of ∀ x (x² ≥ x) if the domain consist of all real numbers? What is the truth value of this statement if the domain consist of all integers? Justify your answer.

   d)   Prove the following statement by method of contradiction.
        "If $3n + 2$ is odd then n is odd".

   e)   Show that following equation has no solution in integers by the method of exhaustive proof $x^2 + 3y^2 = 8$.

   f)   i)   Let Q (x, y) denote the statement "$x = y + 3$". What are the truth values of the propositions Q (1, 2) and Q (3, 0).

          ii)   Translate the following sentence in symbolic form. "Some lawyers who are politicians are congressmen".

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[3834] - 104
M.C.A. I (Under Science Faculty)
MATHEMATICS
CS - 105 : Graph Theory
(2008 Pattern) (New Course) (Sem. - I)

*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 <u>four</u> of the following :   **[4 × 4 = 16]**

    a)   Explain konigsberg problem.

    b)   Draw the following graphs.

        i)   binary tree of minimum height on 15 vertices.

        ii)   eulerian but not Hamiltonian graph.

    c)   Find the eccentricity of each vertex in the trees given below. Find the centre, radius & diameter of following tree.
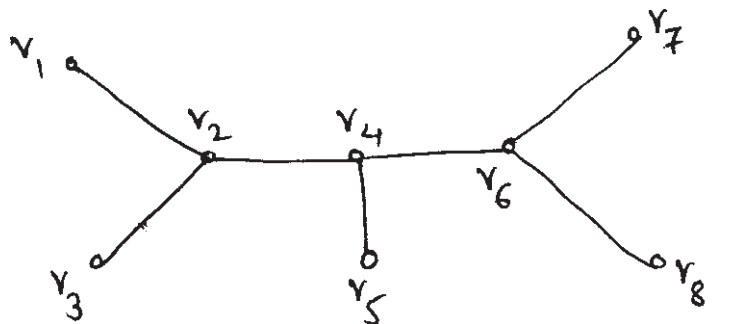
    d)   For the graph G_1, G_2, G_3 given below, find $G_2 \oplus (G_1 \cap G_3)$
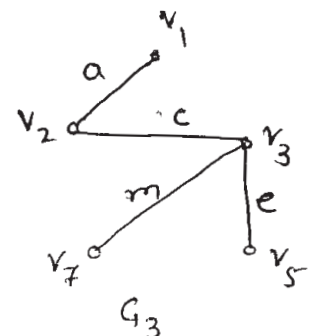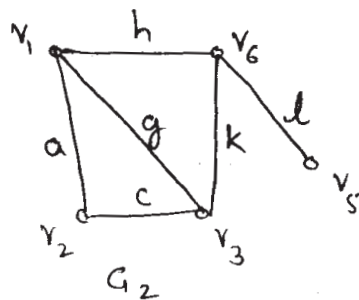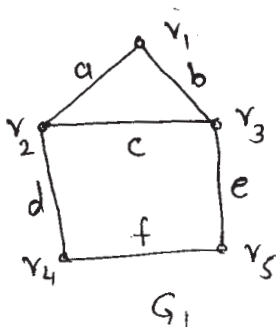
e) Solve the following recurrence relation.

$$3a_{n+2} - 7a_{n+1} - 6a_n = 0, \ a_0 = 0, \ a_1 = 1$$

f) Draw the graph of following incidency matrix and find complement of its underlying graph.

$$I(G) = \begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \end{array} \begin{array}{c} e_1 \ \ e_2 \ \ e_3 \ \ e_4 \ \ e_5 \ \ e_6 \ \ e_7 \ \ e_8 \ \ e_9 \\ \left[\begin{array}{ccccccccc} 1 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 2 \end{array} \right] \end{array}$$

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

a) Can there be a directed graph with six vertices where the out degrees of the vertices are 2, 3, 4, 1, 0 and 5 and the indegrees are 2, 4, 1, 1, 5 and 2?

b) Determine the minimum number of vertices in a simple graph with 25 edges. Also draw such graph.

c) Find an exponential generating function for the number a_r of r-letter words with no rowel used more than one (consonants can be repeated).

d) Define the following with example :

   i) Tournament
   ii) Biparlite graph.

e) Any connected graph with n vertices and n–1 edges is a tree.

f) Which of following pairs of graphs are isomorphic? Label the vertices of each graph appropriately to bring out the isomorphism.
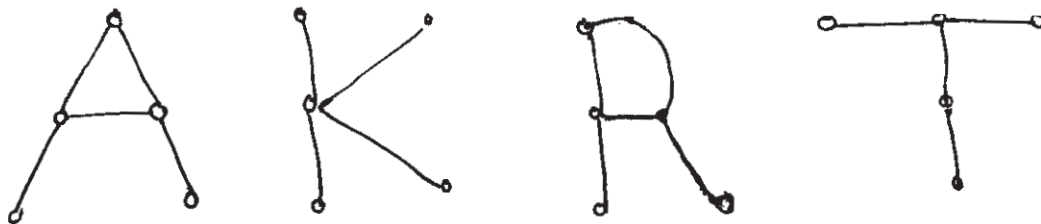

Q3) Attempt any <u>four</u> of the following : **[4 × 4 = 16]**

a) Let G be a graph with n vertices, t of which have degree k and the others are of degree k+1. If e is the number of edges in G. Prove that $t = (k+1)n - 2e$.

b) Prove that a simple graph with n vertices must be connected if it has more than $\dfrac{(n-1)(n-2)}{2}$ edges.

c) Find a minimal spanning tree for following connected weighted graph using Prim's algorithm.
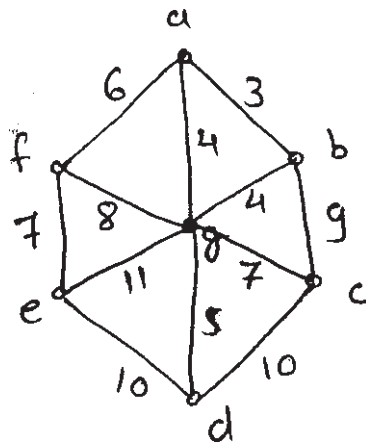
d) Let G be the graph given below. Find G [U] & G [F], where U = {v_1, v_3, v_5} & F = {e_4, e_8, e_6, e_5} & G[X] means G induced by set X.


G.
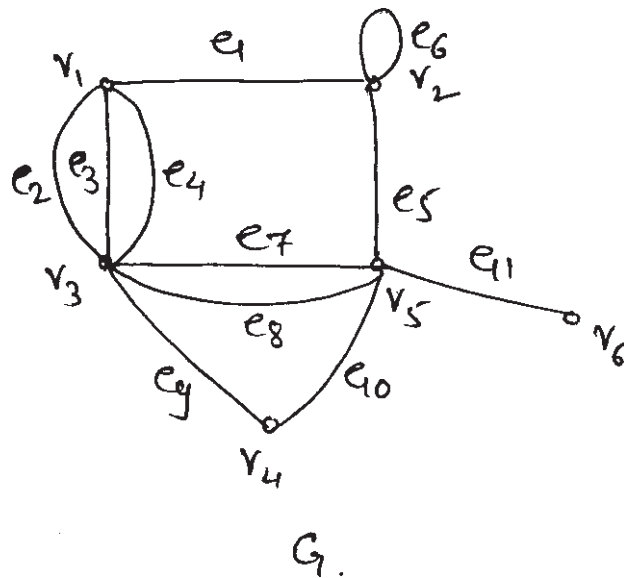
e) Show that if a simple graph G is not connected then its complement $\overline{G}$ is connected. Hence show that if G is simple connected graph & v is a cut vertex in G then v is not cut vertex in $\overline{G}$.

f) Find the Hamiltonian circuit in the dodecahedral graph. Draw it.

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

a) Draw the arborescence and express in polish notation, the expression is

$$f + \frac{ab}{\dfrac{c}{3} + d^4 - e} \cdot$$

b) Solve the recurrence relation,

$a_n - 5a_{n-1} + 6a_{n-2} = 2 + 3n$.

c) Write Breadth first search algorithm.

d) Find the maximum vertex connectivity of a graph with 8 vertices & 16 edges. Draw a graph showing that they are achieved.

e) Obtain preorder and postorder traversals for the following binary tree.
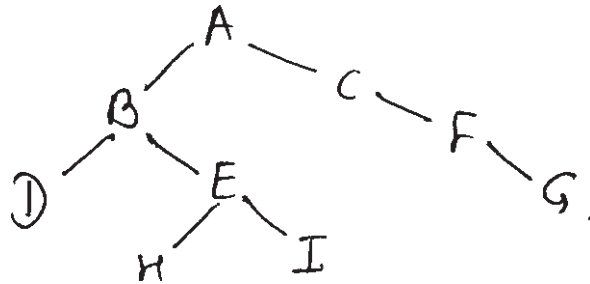

f) Let G be a simple graph on n vertices and $\overline{G}$ its complement suppose that G contains exactly one vertex of even degree. Find the number of odd degree vertices in $\overline{G}$.

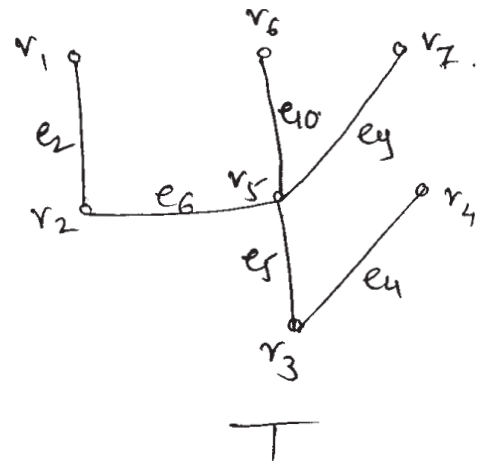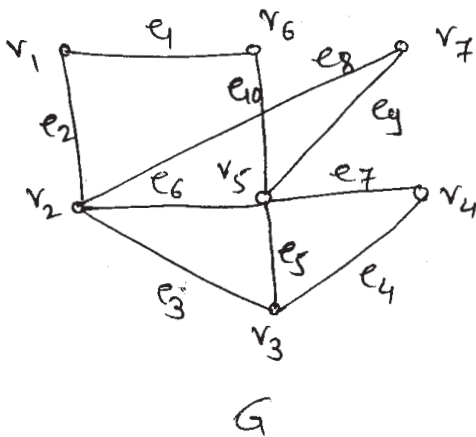**Q5)** Attempt <u>any two</u> of the following :   **[2 × 8 = 16]**

a) Using Fleury's algorithm find euler tour in the following graph G.
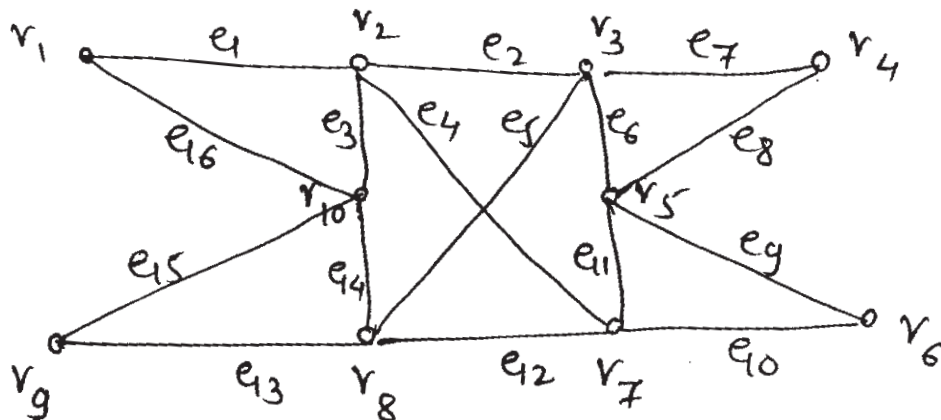
b) Using Dijkstra's algorithm. Find the shortest path from vertex 'a' to all vertices in the weighted graph below.
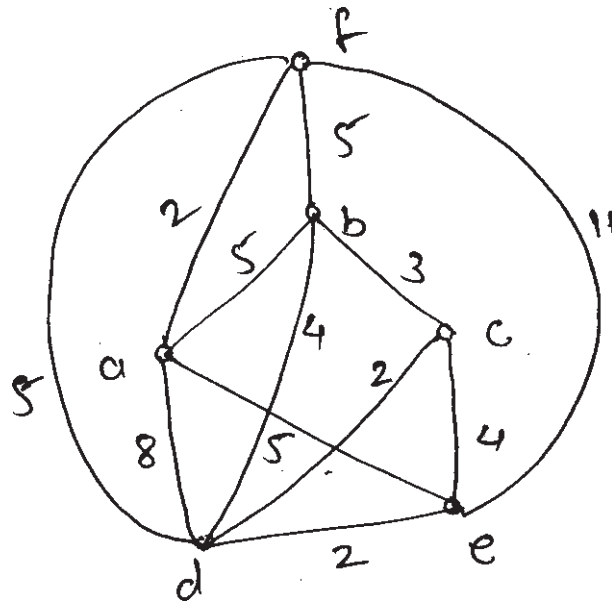
c) Find all fundamental circuits (cycles) & cut sets of following graph G with respect to T.

G

T

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[3834] - 201

M.C.A - I (Under Science Faculty)
COMPUTER SCIENCE

CS - 201 : Data and File Structures Using C
(2008 Pattern) (New) (Sem. - II)

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.*

Q1) Attempt <u>any four</u> of the following: **[4 × 4 = 16]**
a) Construct a binary search tree for the given set of data: (55, 35, 30, 65, 40, 60, 70) Traverse it using all tree traversal methods.
b) Explain sparse and Dense index.
c) Discuss the steps in Quick Sort. State its complexity.
d) Write a function to delete a node from a doubly linked list.
e) What is stack? Explain it.

Q2) Attempt <u>any four</u> of the following: **[4 × 4 = 16]**
a) Define a directed graph. Discuss two graph representation methods with example.
b) Apply heap sort on a given set of data to sort it in ascending order: (30, 55, 48, 37, 10, 91, 84, 31).
c) What is B+tree? Explain its node structure.
d) Explain Priority Queue.
e) Write a function to reverse a singly linked list.

Q3) Attempt <u>any four</u> of the following: **[4 × 4 = 16]**
a) Show the contents of stack at each step for checking the given expression ([A-B] * {(C + < D / E >)}) is either with or without balanced parentheses.
b) Write a short note on ISAM.
c) Discuss various types of rotations used in AVL tree.
d) Write a function to insert a node in a singly linked list.
e) Write a function to check the circular queue is full or empty.

P.T.O

Q4) Attempt <u>any four</u> of the following: **[4 × 4 = 16]**
    a)   Write a function for insertion sort.

    b)   What do you mean by graph traversal? Apply Graph traversal methods on a given graph.
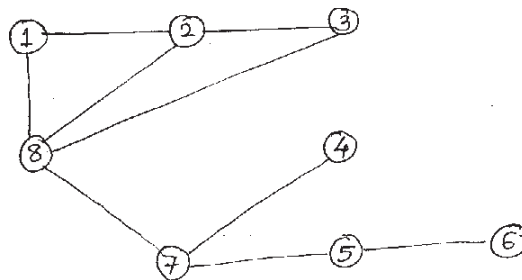
    c)   Write a function to add two polynomials represented by linear linked list.

    d)   Describe primary and secondary indices in file organisation.

    e)   Define
         i)   Sequence
         ii)   Big-oh notation
         iii)   row major
         iv)   Abstract Data Type

Q5) Attempt <u>any four</u> of the following: **[4 × 4 = 16]**
    a)   Write a function to merge two linear linked list to obtain the resulting sorted linked list.

    b)   Discuss the steps in binary search method.

    c)   Discuss any two dynamic memory allocation methods.

    d)   Define
         i)   sibling
         ii)   depth
         iii)   leaf node
         iv)   degree of a node.

    e)   i)   Convert the given infix expression to prefix & post-fix. P/Q ^ R+S*T-U.
         ii)   State two methods used to design hash function.

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[3834] - 202

P855

M.C.A - I (Under Science Faculty)
COMPUTER SCIENCE

CS - 202 : Theoretical Computer Science
(2008 Pattern) (New) (Sem. - 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) Find the transitive closure of the relation
   R = {(1, 2), (2, 3), (3, 4), (5, 4)}.

b) Find the language accepted by following DFA.
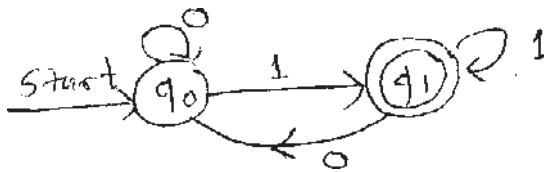
c) Write smallest possible string accepted by following regular expression.
   10 + (0 +11)0*1.

d) Define
   i) Yield of parse tree.
   ii) CSG.

e) Find the language L(G) for following grammar.
   S → aS | bA | a | b | ∈
   A → aS | a | ∈

f) Define recursive and recursively enumerable language.

g) For following grammar show two rightmost derivation for string W="aab".
   S → aS | aS bS | ∈

h) Explain the mapping of 'δ' transition function for Turing Machine (TM).

                                          P.T.O

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

a)   Prove by mathematical induction on *n* that

$$\sum_{i=0}^{n} i^3 = \frac{n^2 (n + 1)^2}{4}$$

b)   Construct DFA for language over $\Sigma = \{0, 1\}$ which accept all string that contain even number's of 0's (zeros) and odd number of 1's (ones)

c)   Design NFA for language containing all string over $\Sigma = \{a,b\}$, such that some two b's are separated by a string whose length is 4K, K> = 0.

d)   Construct Mealy machine over $\Sigma = \{0,1\}$ which toggles its input.

e)   Determine if following language is regular or not
L = {aⁿ bᵐ | m > = n, n > 0 }.

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

a)   Construct NFA with $\in$ - transition for the following regular expression.
((0 + 1) * + 011)*

b)   Find the regular expression representing following set.
   i)   L = set of all strings of a's and b's of length 10 exactly.
   ii)   L = set of all string which contain atleast one 'a' and atleast one 'b'.

c)   Rewrite following grammar after removing useless symbol. Justify your answer.
   S → AB | BC
   A → aA a | aA b
   B → bB | b
   D → dD | d

d)   i)   Rewrite the following grammar after removing $\in$ - production
      S → Xa X | bX
      X → Xa X | Xb X | $\in$
   ii)   Construct CFG for the following language.
      L = {aⁱ bⁿ cⁿ | n > 0, i > = 0}

e)   Minimize the following DFA:
M = ({q_0, q_1, q_2, q_3, q_4, q_5}, {0, 1}, δ, q_0, {q_3, q_5}) Where δ is given as

δ	0	1
q_0	q_2	q_4
q_1	q_0	q_5
q_2	q_2	q_4
*q_3	q_0	q_5
q_4	q_1	q_3
*q_5	q_0	q_5

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

a) Construct PDA for language
   $L = \{ a^X b^Y c^Z \mid X = 2Y + Z, Y, Z >= 1\}$

b) Convert following CFG to GNF.
   $S \rightarrow SS \mid aSb \mid ab$

c) Convert following CFG to CNF
   $S \rightarrow aAbB \mid ABC \mid a$
   $A \rightarrow aA \mid a$
   $B \rightarrow bBdC \mid b$
   $C \rightarrow abc.$

d) Show that $L = \{0^n 1^n 2^n \mid n >= 1\}$ is not a CFL.

e) Construct a PDA equivalent to the following context free Grammar.
   $S \rightarrow aA \mid AA$
   $A \rightarrow aS \mid bS \mid bB$
   $B \rightarrow b \mid c$

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

a) Design TM to accept following language.
   $L = \{a^n b^n a^n \mid n > 0\}$

b) Design a TM to replace an occurance of a substring 'bbb' with 'abb' over $\Sigma = \{a, b\}$.

c) The class of language accepted by NPDA and DPDA is same. Justify true or false.

d) Prove that Halting problem of TM is unsolvable.

e) Explain
   i) Universal TM
   ii) Multitape TM.

[3834] - 203

P856

M.C.A - I (Under Science Faculty)

CS - 203 : Object Oriented Programming (C++ Programming)

(2008 Pattern) (New) (Sem. - 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 <u>all</u> of the following: **[8 × 2 = 16]**

   a)   Give any four applications of OOP.

   b)   What do you mean by late binding?

   c)   List the operators that cannot be overloaded with friend function.

   d)   What is pure virtual function? Give its syntax.

   e)   Which classes define the file handling methods?

   f)   Differentiate between put ( ) & write ( ) function.

   g)   Does C++ support virtual constructor and virtual destructor.

   h)   Give the syntax to create an object of template class.

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

   a)   Differentiate friend function & normal function.

   b)   What is constructor? Explain different types of constructors in brief.

   c)   Explain how the preincrement & postincrement operators are overloaded.

   d)   What is a virtual base class and an abstract base class.

   e)   Explain static class members with suitable examples.

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

   a)   Write a C++ program to accept records of 'n' students & store it in an array of objects. The class student contain following data members.

      int rollno;

      char name [20];

      Float percentage;

      Overload the search functions for following.

      i)   Search by rollno.

      ii)   Search by name.

      iii)   Search by percentage.

b) Write a C++ program for swapping private data of two classes using friend function.

c) Trace the O/P of following program

```cpp
Class X
{    Public:
         X ( )
         {
            cout << " Default constructor \n";
         }
         X (const X &)
         {
            cout << " copy constructor \n";
         }
};
     X user code (X b)
     {    X c = b;
          return c;
     }
main ( )
{    X a;
     cout << " calling usercode ( ) \ n";
     X d = usercode ( a);
     cout << "Back in main ( ) \n";
}
```

d) Trace the O/P of following program

```cpp
Class A
{    public:
         virtual void f1 ( )
         {
         cout << "Base \n";
         }
         ~ A ( )
         {
         cout << "Base destr \n";
         }
};
```

```
Class B : public A
{     public:
            virtual void f1 ( )
            {
                  cout << "Derived \n";
            }
            ~ B ( )
            {
                  cout << "Derived dstr \n";
            }
};
      main ( )
      { A * P = new B;
        P→ f1 ( );
        delete p;
      }
```

e) Explain how to open a file in C++ program? Describe the various file opening modes.

Q4) Attempt <u>any four</u> of the following: **[4 × 4 = 16]**
   a) What is containership? How does it differ from enheritance?
   b) How an exception handled in C++?
   c) Write a note on inline function.
   d) Write a C++ program to copy the content of two binary files into third file.
   e) Write a C++ program using operator overloading to overload the <<&>> operator for class DATE whose data members are dd, mm, yy.

Q5) Attempt <u>any four</u> of the following: **[4 × 4 = 16]**
   a) Trace the output of the following program
       Class A
       { public:
           A ( )
           {
               cout << "cntr \n";
           }
           ~ A ( )

```
        {
            cout << "Dstr \ n";
        }
    };
        A a1, a2;
        main ( )
        {
            A a3, a4, a5;
            int i=0;
            if (i)
                A a6;
            else
                exit (1);
            A a 7;
        }
```

b) Write a program which illustrate the concept of runtime polymorphism.

c) How to overload binary operator using friend function? Explain in detail.

d) What is inheritance? Explain multiple & Hierarchical inheritance with example.

e) Write a C++ program to read the information like plant-name, plant-code, plant-type, price construct the database with suitable member function for initializing & for destroying the data. Viz constructor, copy constructor, destructor.

P861

[3834] - 304

M.C.A. (Science Faculty)
COMPUTER SCIENCE
CS - 305 : Event Driven Programming (Win32 SDK)
(2008 Pattern) (New Syllabus) (Sem. - III)

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) *Assume suitable data, if necessary.*
4) *All questions are compulsory.*

Q1) A movie-actor database stores information about movies and actors in a data source named 'Boy Bollywood'. Write a SDK Program which is menu driven having following facilities:

- Displays list of actors moviewise.
- Displays list of movies, on selecting a particular movie name, displays its budget.
- Delete a movie.

(Make use of ODBC APIs. WinMain not needed)   **[12]**

Q2) Write program statements using Win32 APIs for any four of the following:

[4 × 5 = 20]

a) Display mouse cursor at top right corner of the client area and should be moved to appropriate direction by one pixel whenever left, right, up, and down arrow keys are pressed.

b) Display Horizontal Scroll Bar and add keyboard interface to it.

c) Displays "Hello" when left mouse button is pressed and erased when released.

d) Capturing the mouse for an application Window.

e) Display two push buttons 'Inc' and 'Dec'.

   When 'Inc' is pressed window size increases, while it decreases if 'Dec' is pressed.

Q3) Answer in brief, any eight: **[8 × 2 = 16]**
 a) Give syntax of Message Box API.
 b) How to convert Screen co-ordinates to client co-ordinates and vice versa?
 c) Differentiate : GetDC vs. GetWindowDC.
 d) Why queues are used in keyboard messages?
 e) What are the contents of lparam and wparam for WM-CHAR message?
 f) Which library need to be included to use playsound API?
 g) What is the use of second parameter of WinMain?
 h) What do you mean by invalid region?
 i) What is the implication of the following code:
    Case WM-NCHITTEST : return (LRESULT) NOW HERE;
 j) How does WndProc knows whether character data is 8-bit ANSI or 16-bit Unicode?

Q4) Justify True/False: (any six) **[6 × 2 = 12]**
 a) After calling Create Caret, there is no need to call Show Caret.
 b) Any menu that is attached to a window is automatically destroyed when window is destroyed.
 c) Dialog box procedure within Windows do process WM-CLOSE message.
 d) BitBlt and stretchBlt functions are based on logical units.
 e) WndProc is reentrant.
 f) WM-PAINT is a queued message.
 g) GetMessage API returns zero for WM-DESTROY message.
 h) Program can call Wndproc indirectly.

Q5) Attempt any four: **[4 × 5 = 20]**
 a) Explain APIs used for critical section object.
 b) Explain APIs used for Event objects.
 c) Give Parent Child hierarchy of a Windows MDI application. Explain.
 d) Give Any two approaches used to display DIBs.
 e) Give any three differences between modal and modeless dialog box.

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P862

[3834] - 401

M.C.A. (Under Science Faculty)

CS - 401 : Introduction to UNIX and UNIX Internals

(2008 Pattern) (New) (Sem. - IV)

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) What is the difference between user mode and Kernel mode execution?

b) What is environment variables? Show their usage.

c) Why call to sleep is always enclosed in while loop?

d) What are the contents of boot block?

e) Suppose the Kernel marks a block. Say 53, as a delayed write block and another process wants to access block 53, which is now free. What action the process must follow?

f) What is the purpose of third parameter of open system call.

g) What is the difference between named an unnamed pipe?

h) What is tie-breaker rule?

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

a) Kernel some times prevent the occurrence of interrupts during critical activity.

b) There should never be free inodes whose inode number is less than the remembered inode number.

c) If a process is waiting to read an unnamed pipe and there are no more writer processes, there will never be a writer process.

d) Gsowreg ( ) is never called by Kernel for text region.

e) Successful exec ( ) never returns.

Q3) Attempt any four of the following: **[4 × 4 = 16]**
  a) Explore the race condition for free buffer.
  b) Calculate Block Number and Byte offset into Block for inode number 410. Assuming that Block 3 is beginning of the inode list, each inode is of 128 byte and one disk block is of 1 kB.
  c) Explore the possible deadlock scenario for the link system call.
  d) Explore the race condition for catching signal.
  e) A,B and C are three processes executing at given time instance. Each process has initial priority of 60. Every process, when get scheduled, executes for 1 time quantum which is of 1 second. The clock interrupts the system 60 times in a second. No other process is in the state 'ready to run'. The nice value of process C is set to 20. Assuming that process A gets scheduled for execution at the beginning of first time quantum. Show how the priorities of the process will change and how they will scheduled during next 4 time quantums using the simpler schedular.

Q4) Attempt any four of the following: **[4 × 4 = 16]**
  a) Explain the behaviour of the following program.
      # include <fcntl.h>
      main ( )
      { int fd; char buf [1024];
        fd = creat ("India.txt", 0766);
        lseek (fd, 3000L, 2);
        write (fd, "hello' ,5);
        close (fd);
        fd = open ("India.txt", O-RDONLY);
        read (fd, buf, 1024);
        read (fd, buf, 1024);
        read (fd, buf, 1024);
      }
  b) Write the output of the following program with explanation.
      main ( )
      { int i = o;
        for (i=0 : i<2 : i++)
          {for k ( );
            Print f("I am process at i = %d\n",i);
          }
        if (for k ( ) = =0)
            Printf ("this is a child process\n");
          }

c) Write a C program where parent and child do not share file.

d) Explain the behaviour of the following program.

```
int global;
main ( )
{ int local;
  local = 1;
  if (vfor k ( ) = = 0)
      {global = 2;
       local = 2;
       –exit ( );
      }
Printf ("global % d local % d\n", global local);
}
```

e) Write a shell script to print permission of a given file.

Q5) Attempt any four of the following: **[4 × 4 = 16]**
   a) Draw a neat labelled diagram for process state transition in unix system V.
   b) Write the sequence of operations Kernel follows to handle the interrupt.
   c) How process respond to 'death of child' signal if it is sleeping in wait?
   d) Explain how protection fault is handled in demand paging system.
   e) Describe any four inconsistencies checked by fsck.

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[3834] - 402

P863

M.C.A. - II (Science Faculty)
COMPUTER SCIENCE

CS - 402 : ADVANCED NETWORKING AND MOBILE COMPUTING
(2008 Pattern) (New) (Sem. - IV)

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) *All questions are compulsory.*

Q1) Attempt <u>all</u>:   **[8 × 2 = 16]**

    a) Specify layers in the reference model at which following functionalities are implemented:
       i) device location and handover.
       ii) flow control and congestion control.

    b) Define:- cluster, cell breathing.

    c) Why handover is required in GSM?

    d) Suppose a TCP connection is transferring a file of 5000 bytes. The first byte is numbered 10,001. What are the sequence numbers for each segment if data are sent in five segments, each carrying 1000 bytes?

    e) What are the three domains of the domain name space?

    f) What are the three FTP transmission modes?

    g) What is a URL and what are its components?

    h) Define : piconet, scatternet.

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

    a) What are the main problems of signal propagation? Why is reflection both useful and harmful?

    b) Name the main elements of GSM system architecture and describe their functions.

    c) Explain system architecture of IEEE 802.11.

    d) List the entities of mobile IP and describe data transfer from a mobile node to a fixed node. Why and where is encapsulation needed?

    e) How does Indirect - TCP isolate problems on the wireless link? What are the main drawbacks of this solution?

Q3) Attempt any <u>four</u> of the following: **[4 × 4 = 16]**
    a)   What are the services of User Agent in SMTP?
    b)   What are the issues to be considered while connecting different LANs using bridges?
    c)   "WML Script offers several capabilities not supported by WML." Justify.
    d)   Why is a new infrastructure needed for GPRS? Which components are new and what is their purpose?
    e)   What are the main reasons for using cellular systems? How is SDM typically combined with FDM?

Q4) Attempt any <u>four</u> of the following: **[4 × 4 = 16]**
    a)   What are the main benefits of a spread spectrum system? What are the advantages of DSSS over FHSS?
    b)   What are the requirements for mobile IP?
    c)   How connection is established in TCP? What is the SYN flooding attack? What are the strategies to alleviate the effects of a SYN attack?
    d)   What is the purpose of following methods in HTTP?
        i)   GET
        ii)   HEAD
        iii)   POST
        iv)   PUT
    e)   Explain WAE logical model.

Q5) Attempt any <u>four</u> of the following: **[4 × 4 = 16]**
    a)   Why routing in multi-hop ad-hoc networks is complicated?
    b)   What are the services offerred by SCTP to the application layer processes?
    c)   What are the advantages and disadvantages of CDMA?
    d)   What is the reaction of standard TCP in case of packet loss? Why is it quite often problematic?
    e)   What are the uses of UDP (User Datagram Protocol)?

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[3834] - 403

P864

M.C.A. - II (Under Science Faculty)
CS - 403 : Distributed Database Systems
(2008 Pattern - New) (Sem. - IV)

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

  a)   Define:

   i)   Primary Horizontal Fragmentation.

   ii)   Derived Horizontal Fragmentation.

  b)   State different types of transactions.

  c)   State different ways in which lock management is done.

  d)   State different distributed query optimisation algorithms.

  e)   State different layers of Query Processing.

  f)   Define:

   i)   Dirty Read.

   ii)   Non-repeatable Read.

  g)   In DBMS standardization, a reference model can be described, according to which 3 approaches?

  h)   Explain shared nothing multiprocessor system.

Q2) Attempt any <u>four</u>:   **[4 × 4 = 16]**

  a)   Explain transparent management of distributed and replicated data.

  b)   Write a short note on MDBS architecture.

  c)   Explain top-down design process.

  d)   What is Query Optimisation? Explain Query Optimisation process.

  e)   Write a short note on Timestamp based concurrency control.

Q3) Answer any <u>four</u>:   **[4 × 4 = 16]**

    a)   The ROWA protocol reduces the availability of database in case of failure. Comment.

    b)   Discuss Fix/Flush LRM algorithm.

    c)   Explain 2PC protocol.

    d)   Discuss the correctness criteria for derived horizontal fragmentation.

    e)   Draw the query graph for the following query.

        SELECT ENAME, RESP

        FROM EMP, ASG, PROJ

        WHERE EMP.ENO = ASG. ENO

        AND PNAME = "CAD/CAM"

        AND DUR $\geq$ 36

        AND TITLE = "Programmer"

        What do you observe? What is the solution to the problem? Explain.

        (The relational schema is:

        EMP (<u>ENO</u>, ENAME, TITLE)

        PROJ (<u>PNO</u>, PNAME, BUDGET)

        ASG (<u>ENO, PNO</u>, RESP, DUR))

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

    a)   Consider the following query:

        SELECT PERSON - NAME FROM

        PERSON P, DISEASE D, PERSON-DISEASE PD

        WHERE P.SSNO = PD. SSNO

        AND PD.DNO = D.DNO

        AND D.DISNAME = 'SWINEFLU'

        AND P.AGE < 45;

        Optimise the above query, using the Ingres query optimisation algorithm for centralised query optimisation.

    b)   Consider the relation EMP(<u>ENO</u>, ENAME, TITLE)

        Let P_1: TITLE < "programmer" and P_2 : TITLE > "Programmer" be two simple predicates.

        i)   Perform a horizontal fragmentation of EMP w.r.t. $\{P_1, P_2\}$.

        ii)   Explain why resulting fragmentation (EMP$_1$, EMP$_2$) does not fulfil the correctness rules of fragmentation.

        iii)   Modify the predicates, compose minterm predicates and perform horizontal fragmentation of EMP.

            (Assume suitable tuples in EMP)

c) Relation EMP ($\underline{ENO}$, ENAME, TITLE) is split into 3 horizontal fragments EMP_1, EMP_2, EMP_3 defined as follows:

$$EMP_1 = \sigma_{ENO \leq \text{"E3"}} (EMP)$$
$$EMP_2 = \sigma_{\text{"E3"} < ENO \leq \text{"E6"}} (EMP)$$
$$EMP_3 = \sigma_{ENO > \text{"E6"}} (EMP)$$

and the relation

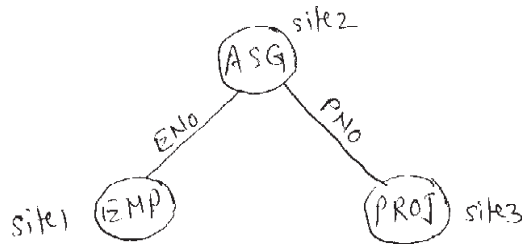ASG ($\underline{ENO, PNO}$, RESP, DUR) is fragmented as

$$ASG_1 = \sigma_{ENO \leq \text{"E3"}} (ASG)$$
$$ASG_2 = \sigma_{ENO < \text{"E3"}} (ASG)$$

For the following query draw the equivalent generic query tree and the reduced query tree. Also state the rules which are used.

Query: SELECT *

FROM EMP, ASG

WHERE EMP.ENO = ASG.ENO

d) Consider the following query in relational algebra

$PROJ \bowtie_{PNO} EMP \bowtie_{ENO} ASG$ whose join graph is

The fragmentation of relations is as follows:

Relation	Site1	Site2	Site3
EMP	1000	1000	1000
ASG		2000	
PROJ	1000		

Also, assume that size ($EMP \bowtie ASG$) = 2000 and size ($ASG \bowtie PROJ$) = 1000. Apply the algorithm of distributed INGRES in general network, so that communication time is minimised.

e) Consider the relations:
EMP ($\underline{ENO}$, ENAME, TITLE)
PROJ ($\underline{PNO}$, PNAME, BUDGET)

ASG (<u>ENO, PNO</u>, RESP, DUR)

Given a one-to-many relationship from EMP to ASG. Relation ASG can be indirectly fragmented according to the following rules:

$ASG_1 = ASG \ltimes_{ENO} EMP_1$

$ASG_2 = ASG \ltimes_{ENO} EMP_2$

Predicate on EMP gives

$EMP_1 = \sigma_{TITLE} =$ "Programmer" (EMP)

$EMP_2 = \sigma_{TITLE} \neq$ "Programmer" (EMP)

Query: Retrieve all attributes of tuples from EMP and ASG that have same value of ENO and title "Mech.Eng."

Draw the generic query tree and the <u>reduced trees</u>. Also state the rules used for reduction of the tree.

Q5) Answer any <u>four</u>: [4 × 4 = 16]

a) Write a short-note on lazy replication protocol.

b) Explain in-place update recovery.

c) Explain 3PC Termination protocol with the help of state transitions, co-ordinator Timeouts, participant timeouts.

d) Write a short note on network partitioning.

e) Consider the following schedules and explain whether they are serializable, recoverable and conflict serializable.

$S_1 = T_1 : R(X), T_2 : R(X), T_1 : W(X), T_2 : W(X)$

$S_2 = T_1 : W(X), T_2 : R(Y), T_1 : R(Y), T_2 : R(X)$

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P865

[3834] - 404

M.C.A. (Science Faculty)

CS - 405 : Object Oriented Software Engineering

(2008 Pattern) (New) (Sem. - IV)

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)   Assume suitable data, if necessary.

4)   All questions are compulsory.

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

a)   Which are the elements of a use-case diagram?

b)   Explain the behavioral things of UML.

c)   Which are the important relations in object Oriented Modelling.

d)   Briefly explain Top-Down integration testing.

e)   What is the process of Reverse Engineering?

f)   Explain any two principles of Modeling.

g)   What do you understand by multiplicity of an associations role?

h)   State the use of polymorphism.

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

a)   Explain elements of an object model.

b)   Discuss the steps followed to forward engineer a class diagram.

c)   Which are the attributes of a well structured deployment diagram?

d)   Explain the different types of testing.

e)   Write a note on Generic Components of object Oriented Design Model.

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

a)   Prepare an object diagram showing at least 7 relationships among the following object classes. Include associations aggregation and generalization, show multiplicity. Additional attributes may be added if necessary.

Play ground, School, Principal, Classroom, Student, Book, Teacher, Computer, Desk, Chair.

b) Draw a sequence diagram to represent the steps followed while accessing an eMail account.

c) A Music player has ON/OFF, STOP/EJECT, PLAY, REWIND and FAST FORWARD buttons, first two buttons allow toggling between the two states. Draw the State Chart diagram.

d) A system is to be designed for Bank application. A Bank has many customers. There are two types of accounts - Savings and current. In each case the account holder may request to withdraw or deposit the amount. The account details are verified before transaction. If the account holder wants to withdraw money the balance is checked to verify if it is within limit. Draw the use case and Activity diagram.

e) Draw a class diagram for a retail system, including customer, order, Product and Transaction.

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

a) Discuss the Resource Management Component.

b) Explain the UP Phases.

c) Which are the goals of Elaboration?

d) Draw an activity diagram for the Business process of Meeting a new client.

e) What is the purpose of a Deployment diagram, explain its contents?

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