GAUHATI UNIVERSITY
CENTRE FOR DISTNACE AND ONLINE EDUCATION
HOME ASSIGNMENT
Master of Science in Information Technology (M.Sc.-IT)
Semester- I (Session: 2023-2024)

***Guidelines for Submission*:**

1. Learners who have been admitted in the Academic Session 2023-24 will write the Home Assignment.
2. Learners should write their **Roll Number**, **GU Registration Number**, **Subject**, **Semester, Paper Title**, **Paper Code** and **Name of the Study Center** clearly on the first page of the answer script in the space provided.
3. The formats of the answer scripts are available at, and can be downloaded from, the GUCDOE website (www.gucdoe.in).
4. There will be 2 (two) compulsory questions in each paper, and each question will have options (Total Marks: 2 questions × 10 marks= 20 marks).
5. **Typed/Computerized answers will not be accepted**. Learners will write the answers neatly in their own handwriting.
6. Learners should not submit any plagiarized answers as such a practice is deemed to be unfair.
7. Learners of different Study Centers under GUCDOE will mandatorily submit the answer scripts at their respective Study Centers.
8. Learners of GUCDOE center will submit their answer scripts at GUCDOE Office.
9. **Last Date of Submission : 18th January, 2024.**

PAPER: INF 1016 (ADVANCED CONCEPTS IN OBJECT ORIENTED PROGRAMMING)

Q. No:1. Write a C++ program to manage Patient details in a hospital. The program should include four classes that are Patient, Doctor, Bill and Hospital. Use concepts of inheritance, encapsulation, and polymorphism to model relationships between these classes. The necessary records should be stored in text files. 10

Or

Model a Car Rental Management System using Object Oriented Design. Model the classes and relationships for rental cars. The system must provide facility to the customer so that he or she can change vehicle, pick-up/drop-off locations and upgrade his or her rental plan. 10

Q. No:2. Find out the advantages of Object Oriented Programming by comparing it with Procedural Programming. Provide proper examples to justify each of your points. 10

Or

Discuss one scenario where both Multi-level inheritance and Hierarchical inheritance are required to be implemented. Write a C++ program to implement it. 10

PAPER: INF 1026 (ADVANCED COMPUTER ORGANIZATION AND ARCHITECTURE)

Q. No:1. What do you understand by pipelining and superscalar processors? Consider an example of your own to showcase how both are related? 5+5=10

Or

Explain the data transfer techniques in Input-Output processor. 10

Q. No:2. Explain the basic cache optimization technique with the help of an example. 10

Or

Consider an example of your own and explain the relationship between address and memory space in a virtual memory system. 10

PAPER: INF 1036 (OPERATING SYSTEM)

Q. No:1. How can you select the best fit process scheduling algorithm in different situations? Give your own opinions. 10

Or

Explain different distributions of Linux. Which Linux distribution is best for the beginners? Give your opinions. 10

Q. No:2. Is it possible to have a deadlock involving only a single process? Explain your answer. What is the optimistic assumption made in the deadlock-detection algorithm? How can this assumption be violated? 10

Or

How is virtual memory related to paging? What are the problems occurs in a system without virtual memory? 10

PAPER: INF 1046 (MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE)

Q. No:1. Answer any two of the following:

(a) Consider the binary relation (I,R) on the set of positive integers defined as 5

(a, b) ∈ R if and only if b is a multiple of a.

Is the relation (i) Reflexive (ii) Symmetric and (iii) Transitive? Justify your answer.

Is it a partial ordering relation in I? Is it an equivalence relation?

(b) Let A = {2, 3, 4, 5, 6, 7, 8, 12, 24} and $1 \times 5 = 5$

R = {(4, 4), (4, 10), (6, 6), (6, 8), (8, 10), (6,12), (4,7), (10,12)} be a binary relation on set A. Determine

(i) The reflexive closure of R.

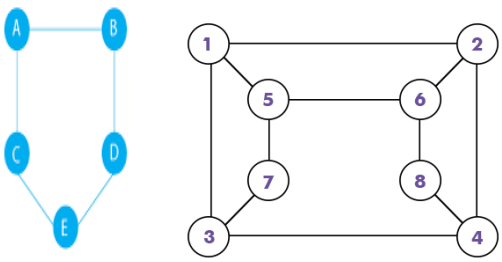
(ii) The transitive closure of R

(iii) The symmetric closure of R

(iv) Both reflexive and transitive closure of R.

(v) Is R a function from A to A?

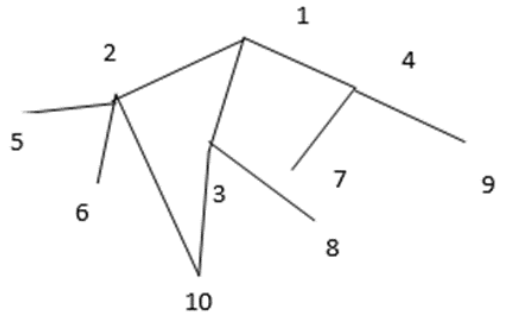
(c) (i) Show that the following graphs are Bipartite. $1.5 + 1.5 = 3$



(ii) Find two spanning trees each of the above two graphs. 2

Q. No:2. Answer any Two of the following.

(a) (i) Find the Adjacency Matrix of the following Graph. 2



(ii) Given the adjacency matrix of an undirected graph G, how can you find the degree of a vertex and the total number of edges in G? Describe. How can you check if there is an edge connecting two given vertices? 3

(b) 1 + 2 + 2 = 5

(i) Find the DNF (Disjunctive Normal Form) of the logical expression $P \wedge (P \rightarrow Q)$

(ii) Show that $\neg(P \wedge Q) \vee Q$ is a tautology.

(iii) Determine the truth value of each of the following statements where U = {1,2,3} is the universal set.

(I) $\exists x \forall y,\ x^2 < y + 1$ (II) $\forall x \exists y, x^2 + y^2 < 12$

(c) (i) Design Finite Automata for the following languages. 1.5 × 2 = 3

(I) The language consisting of all strings in {a, b} having "abab" as a substring.

(II) The language consisting of all strings in {c, d} having an odd number of d's.

(ii) Find Regular Expressions for the above two languages. 1 + 1 = 2

PAPER: INF 1056 (ADVANCED DATABASE MANAGEMENT SYSTEM)

Q. No:1. What are the three main categories of constraints of a relational model? Explain the necessity of having constraints in a relational model by citing an example of your own? 3+7 = 10

Or

Explain how can the basic operations insert, update and delete violate the referential integrity rules with the help of an example of your own. 10

Q. No:2. Consider the following relational database schema consisting of the four relation schemas:

passenger (pid, pname, pgender, pcity)
agency (aid, aname, acity)
bus (bid, bdate, time, src, dest)
booking (pid, aid, bid, bdate)
where:
pid = Passenger ID
pname = Passenger Name

pgender = Passenger Gender
pcity = Passenger City
aid = Agency ID
aname = Agency Name
acity = Agency City
bid = Bus ID
bdate = Booking Date
time = Time of the bus
src = Source
dest = Destination

Answer the following questions using relational algebra queries with an explanation of the operators used in each of the queries: 5×2=10

a) Get the complete details of all buses to Guwahati
b) Get the details about all buses from Dibrugarh to Guwahati.
c) Find the passenger names for passengers who have bookings on at least one bus.
d) Get the details of buses that are scheduled on both dates 12/12/2023 and 13/12/2023 at 16:00 hours.
e) Get the details of buses that are scheduled on either of the dates 11/12/2023 or 22/12/2023 or both at 16:00 hours.

Or

What is a key? Explain the need of a foreign key in a relation with the help of an example. Mention the difference between candidate key and super key. Give an example of super key and foreign key. 2+4+2+2=10

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Gauhati University

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Centre for Distance and Online Education

ASNWERSCRIPT FOR HOME ASSIGNMENT

Roll Number (8 digit): .....
(GUCDOE Enrollment No)

G.U. Registration No.: .....

Programme Name: .....

Semester: .....

Paper Title: .....

Paper Code: .....

Name of the Study Centre:.....

N.B.: Please note that the Name of the Candidate should not be mentioned anywhere. If found, the asnwer script will not be evaluated.)