NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
B.TECH. VI-SEMESTER :: CYCLE TEST I
CSPC51 – COMPUTER ARCHITECTURE 106122100

Course/ Branch/Section: B. Tech/ CSE/B
Max. Marks: 20

Date: 30.08.2024
Duration: 1 hour

Answer All Questions

1. When parallelizing an application, the ideal speedup is speeding up by the number of processors. This is limited by two things: percentage of the application that can be parallelized and the cost of communication. Amdahl's Law takes into account the former but not the latter.
   a) What is the speedup with eight processors if, for every processor added, the communication overhead is 0.5% of the original execution time. [2]
   b) What is the speedup with N processors if, for every time the number of processors is doubled, the communication overhead is increased by 0.5% of the original execution time? [2]

2. a) With an example explain the cache optimization technique to reduce the miss rate. [2]
   b) Can you think of a way to test some of the characteristics of an instruction cache using a program? Hint: The compiler may generate a large number of nonobvious instructions from a piece of code. Try to use simple arithmetic instructions of known length in your Instruction set architecture (ISA). [2]

3. a) Consider an implementation of MIPS ISA with 500 MHz clock and
   – each ALU instruction takes 3 clock cycles,
   – each branch/jump instruction takes 2 clock cycles,
   – each sw instruction takes 4 clock cycles,
   – each lw instruction takes 5 clock cycles. [3]

   Also, consider a program that during its execution executes:
   – x=200 million ALU instructions
   – y=55 million branch/jump instructions
   – z=25 million sw instructions
   – w=20 million lw instructions

   Find CPU time. Assume sequentially executing CPU.
   b) What Is Multiprocessor Cache Coherence? Differentiate between snoopy-based protocol and directory-based protocol in computer architecture with neat diagrams. [3]

(P.T.O)

4. a) Suppose we have a deeply pipelined processor, for which we implement a branch-target buffer for the conditional branches only. Assume that the misprediction penalty is always four cycles and the buffer miss penalty is always three cycles. Assume a 90% hit rate, 90% accuracy, and 15% branch frequency. How much faster is the processor with the branch-target buffer versus a processor that has a fixed two-cycle branch penalty? Assume a base clock cycle per instruction (CPI) without branch stalls of one. [3]

b) Suppose we have a processor where a write miss takes 50 cycles to establish ownership, 10 cycles to issue each invalidate after ownership is established, and 80 cycles for an invalidate to complete and be acknowledged once it is issued. Assuming that four other processors share a cache block, how long does a write miss stall the writing processor if the processor is sequentially consistent? Assume that the invalidates must be explicitly acknowledged before the coherence controller knows they are completed. Suppose we could continue executing after obtaining ownership for the write miss without waiting for the invalidates; how long would the write take? [3]

**********Best Wishes**********

Department of Computer Science and Engineering

Cycle Test 1

CSPE 51 – Augmented and Virtual Reality

Date : 30.08.2024 **Time : 10.30 am – 11.30 am** **Max. mark : 20**

1. a) List out the challenges involved in immersive technologies.
   b) What is FoV? In what way is it useful in VR technologies?
   c) How many degrees of freedom does Oculus Quest 2 HMD track? Explain them.
   d) In what ways does the participant interact with the objects in the virtual world? Explain th interaction ways with suitable examples. (3
2. a) How is the reality perceived in VR? (3
   b) What is haptic feedback and how is it useful in VR? Give an example of it. (2
   c) Explain different travel paradigms used in VR experiences. (2
3. a) A Bezier curve is drawn with the control points P, Q, R, S. To alter the shape of the curve one needs to shift ----------. (4
   b) Consider a circle of radius 2 with center located at (2,2). Perform a rotation of 90° to the center. What is the new coordinate value after rotation? (1)
   c) In a 2D graphics system, the transformation matrix reflects a point about the diagonal line passing through the origin and line (10,10). Is the resultant transformation being same as the following? "The coordinate matrix rotated 45° clockwise direction followed by the reflection about X-axis and finally applying inverse rotation about the origin". Justify your answer with an example. (2) (3)

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI-620015
B.TECH. DEGREE (FIFTH SEMESTER)
BRANCH: COMPUTER SCIENCE AND ENGINEERING
ASSESSMENT 1
SUB.CODE & TITLE: CSPC53 COMPUTER NETWORKS

TIME: 3.30 P.M.- 4.30P.M. DATE: 29.08.2024 MAX. MARKS: 20

ANSWER ALL QUESTIONS

1. What is a Peer-to-Peer Process? What are its functions? (2)
2. How messages are transmitted in i) connection-oriented service and ii) connectionless service? (3)
3. What are the layers of TCP/IP? What are the functions of each layer? What is the fundamental unit of the message at each layer? (4)
4. Why mesh topology is robust in nature? (2)
5. Compare: Transparent Learning Bridge and Transparent Spanning Tree Bridge. (3)
6. Consider the following bit pattern: 1100110111100101
   Show the signal that is sent using a diagram, i) If the bit rate is 16 bit/sec and baud rate is 8 baud/ sec and ii) if the bit rate is 8 bit/sec and baud rate is 4 baud/sec. (2)
7. Consider the following bit pattern:
   1 0 1 0 0 0 0 0 1 1 1 1 0 0 1 1 0 1
   Show the NRZ, Manchester, NRZ-I and AMI encoding for the bit pattern. (4)

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NATIONAL INSTITUTE OF TECHNOLOGY,
TIRUCHIRAPPALLI – 620015
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech (CSE) - Cycle Test 1 – July - December 2024

CSPC54– Introduction to Artificial Intelligence and Machine learning

Semester: V, Section B **Max Marks: 15**

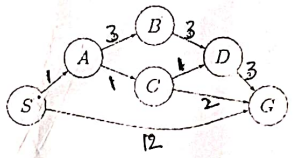
Curriculum: NITTUGCSE21 **Time: 1 hour**

Date of Exam: 28th August 2024

1. Give PEAS for the following activities: (CO2) (2)
   a. Practising Tennis against a wall
   b. Amazon's recommendation system.
2. Give a complete problem formulation for the following problem so that the implementation is possible. "You have three jugs, measuring 12 gallons, 8 gallons and 3 gallons and a water faucet. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure out exactly one gallon".
   (CO2) (2)
3. Consider a state space where the start state is number 1 and each state "k" has two successors: numbers 2k and 2k+1. (3)
   a. Draw the portion of the state space for states 1 to 15.
   b. Suppose the goal state is 11. List the order in which the nodes will be visited for BFS, Depth limited search with limit 3, and iterative deepening search.
   c. How well would bidirectional search work on this problem? What is the branching factor in each direction of the search?
4. Consider the search problem represented in the following figure, where *S* is the start node and *G* is the goal node. Consider the following heuristic function: (CO1) (3)

State	h_1	h_2
S	5	4
A	3	2
B	6	6
C	2	1
D	3	3
G	0	0

- Given this information, run A* search for both the heuristics and determine the path to reach from S to G.
- Are the heuristic functions h_1 and h_2 admissible and consistent? Explain why or why not.



5. Determine the values of each node by applying minimax procedure. Show the results after applying α-β pruning. (CO1) (3)

6. Consider the following dataset. Apply Naïve Bayes algorithm and predict that if a fruit has the following properties which type of fruit it is. Fruit = {Yellow, sweet, Long}. What is the issue in this dataset? How do you eliminate? (CO4) (2)

Fruit	Yellow	Sweet	Long	Total
Mango	350	450	0	650
Banana	400	300	350	400
Others	50	100	50	150
Total	800	850	400	1200

--- Best Wishes ---

National Institute of Technology, Tiruchirappalli - 15.
Department of Computer Science & Engineering
CSPC52- Database Management Systems
Cycle Test –I

Class / Semester : III yr CSE / V sem. Time : 10:30 to 11.30 AM

Venue & Date : ORION F10 & 28/08/2024 Max. Marks : 20

Answer all questions

1. What is physical data independence? Give an example. (2)
2. The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Here's the information that you gather: (5)
Patients are identified by an SSN, and their names, addresses, and ages must be recorded. Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded. Each pharmaceutical company is identified by name and has a phone number. For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer. Each pharmacy has a name, address, and phone number. Every patient has a primary physician. Every doctor has at least one patient. Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another. Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. You can assume that, if a doctor prescribes the same drug for the same patient more than once, only the last such prescription needs to be stored. Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract. Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

a. Draw an ER diagram that captures the preceding information. Identify all constraints captured by the ER diagram.

b. How would your design change if each drug must be sold at a fixed price by all pharmacies?

c. How would your design change if the design requirements change as follows: If a doctor prescribes the same drug for the same patient more than once, several such prescriptions may have to be stored.

3. Suppose that we have a ternary relationship R between entity sets A, B, and C such that A has a key constraint and total participation and B has a key constraint; these are the only constraints. A has attributes a1 and a2, with a1 being the key; B and C are similar. R has no descriptive attributes. Write SQL statements that create tables corresponding to this information so as to capture as many of the constraints as possible. (2)
4. Suppose you have a view SeniorEmp defined as follows: (2)

```
CREATE VIEW SeniorEmp (sname, sage, salary)
AS SELECT E.ename, E.age, E.salary
FROM Emp E
WHERE E.age > 50
```

a. Give an example of a view on Emp that could be automatically updated by updating Emp.

b. Give an example of a view on Emp that would be impossible to update (automatically) and explain why your example presents the update problem that it does.

(P. T.O)

5. Consider the following schema: (3)

Suppliers(sid: integer, sname: string, address: string)
Parts(pid: integer, pname: string, color: string)
Catalog(sid: integer, pid: integer, cost: real)
Write the following queries in relational algebra.

a. Find the names of suppliers who supply some red part.
b. Find the sids of suppliers who supply some red or green part.
c. Find the sids of suppliers who supply some red part or are at 221 Packer Street.

6. Answer the following questions about the table below: (3)

model	make	type	color	country	year	expensive
Accord	Honda	sedan	black	Japan	1999	no
Accord	Honda	coupe	blue	Japan	2000	no
Accord	Honda	sedan	green	Japan	2001	no
s2000	Honda	sports	grey	Japan	2000	yes
Civic	Honda	coupe	white	Japan	2003	no
Civic	Honda	compact	red	Japan	2000	no
m3	BMW	sports	blue	Germany	2002	yes
m3	BMW	sports	black	Germany	2003	yes
330ci	BMW	compact	black	Germany	2003	no
E500	Mercedes	luxury	grey	Germany	2003	yes
ML500	Mercedes	SUV	black	Germany	2004	yes

a. List the functional dependencies that might hold.
b. List the candidate keys.
c. List update, insertion, and deletion anomalies associated with this schema.

7. Relation R = SNCPXYQ was decomposed into {SNC}, {PXY}, and {SPQ}. Considering the following functional dependencies S->NC, P->XY, and SP->Q, Find whether this decomposition had a lossless join. (2)

8. Consider the following ER diagram. While converting to relational model, how many tables are possible at maximum? (1)