VIT
Vellore Institute of Technology

Slot : B1+TB1

School of Computer Science Engineering and Information Systems

Fall Semester 2023-2024

Continuous Assessment Test – II

Programme Name & Branch: MCA

Course Name & code: Database Systems- PMCA503L

Class Number (s): VL2023240106181, VL2023240106185, VL2023240106189

Faculty Name (s) MUTHAMIL SELVAN T, KARTHIKEYAN J, TAPAN KUMAR DAS

Exam Duration: 90 Mins **Maximum Marks: 50**

Answer all the Questions. (10×5)

1. Let R (X, Y, Z, W) be a relational schema with the following functional dependencies:

{X→Y, Y→Z, Z→W, W→Y}

Prove that the decomposition of R into R_1(X, Y), R_2(Y, Z) and R_3(Y, W) is lossless join and dependency preserving.

2. Consider a relation schema R (A, B, C, D, E, G, H) and the following set of functional dependency.

F = {A → BC, B → CE, A → EG, AC → H, D → B}.

Find out a key of the schema and decompose it till Third normal form.

3. Consider the following relational database schema to record access of social networks. The primary keys are underlined. The foreign keys are self-explanatory.

USER (**User_id**, Name, Location, DoB, Profession),

ACCESSES (**User_id, Web_site_address**, Date_of_membership),

SOCIAL_NETWORK (Popular_name, **Web_site_address**, Rank_in_popularity, Date_of_inception),

Write down the necessary SQL statements for the following:

a) Create the above tables with the necessary primary key and foreign key. (4 Marks)

b) List the name and profession of all users from China. (2 Marks)

c) List the popular name of the social network and its web site address in decreasing order of its rank in popularity. (2 Marks)

d) List the user details who have taken membership after 1st September 2023 for the social network 'XYZ'. (2 Marks)

4. Write a PL/SQL code to print the student's grade accepting their marks in four different subjects interactively. 'A' grade is awarded if average mark is greater than 90, 'B' grade if average mark lies in between 80 and 90, 'C' grade if average mark lies in between 70 and 80, 'N' grade if average mark below 70.

5. Consider the following relational database schema.

EMPLOYEE (E_Id, Ename, Salary, DoB, D_Id)

DEPARTMENT (Dept_Id, P_Id, Dname, Budget, Status)

PROJECT (Prj_Id, Pname, Code, Report)

The primary keys are underlined. The attribute D_Id is a foreign key of the EMPLOYEE relation that refers to the DEPARTMENT relation and P_Id is the foreign key of the DEPARTMENT relation that refers to the PROJECT relation. Write down evaluation plans for the following query, develop the query tree and apply heuristic optimization technique.

Display project name, department name and employee name for employees drawing a salary higher than $50000 and budget higher than $2000000.

VIT
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Slot: A1+TA1

School of Computer Science Engineering and Information Systems

Fall Semester 2023-2024

Continuous Assessment Test – II

Programme Name & Branch: MCA

Course Name & code: PMCA502L

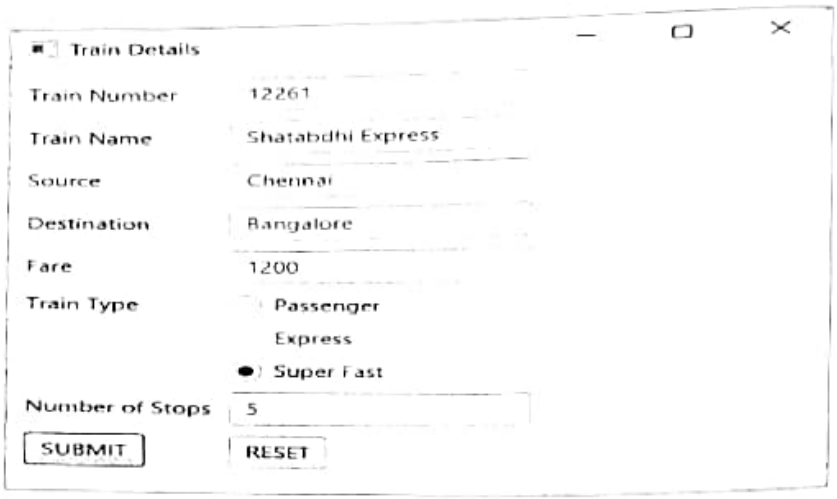
Class Number (s): VL2023240106170, VL2023240106174, VL2023240106179

Faculty Name (s): Dr. Mareeswari V, Dr. Thilagavathi M, Dr Vijayarani A

Exam Duration: 90 Min.

Maximum Marks: 50

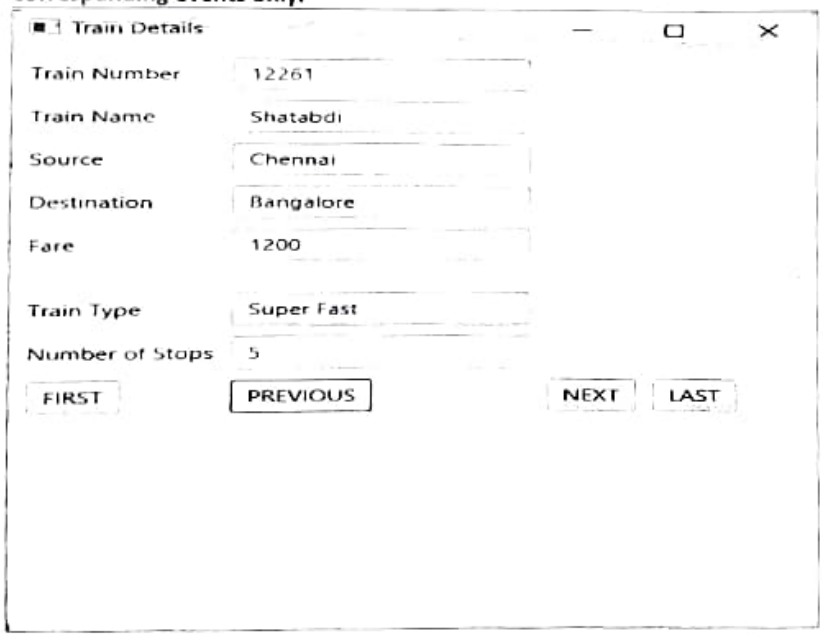
Q.No.	Question	Max Marks
1.	Create a user defined class which inherits thread class to do the given tasks: a. An array to store integer numbers. b. Create a constructor to initialize the array through array parameter. c. To override the run method so that it finds the count of even numbers in the array. Display the count. Write a Demonstrate class where few objects of the above user defined class to be created with array as parameter. Then invoke the run method such that the job of object1 should be completed before the next object. (Note: no need to get input for the array, instead define array with initial values)	10
2.	The Doctor-Patient process: Initially doctor is provided with two patients where first patient is inside the room and second patient is waiting outside the room. Once doctor completes the check up for both patients then the service queue allows next two patients to meet the doctor. The doctor can attend 'n' patients Write a synchronized Java thread program with intercommunication between threads to meet this requirement.	10
3.	Create a JavaFX program to collect the train details as mentioned in the following user interface. Display the train details when the number of stop is less than 7. Otherwise display "No Trains". Clear all input fields when the user clicks "RESET" button.	10



4. Assume that the train detail table is available in Derby under the database ProjDB1. The train number is the primary key. Write a console based java code to collect those details from user input. Then check for the existence of the primary key. Insert the record into the table, if it is not existing. 10

5. Design a JavaFX code to display the details of train table (as mentioned in question-3) with the navigation buttons as shown below: 10

(Note: here should not write the code for adding the controls which are already done in question -3). Write the code to add navigation buttons and its corresponding events only.



The first record to be displayed when the "FIRST" button is clicked and so on.

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Slot : E1+TE1

School of Computer Science Engineering and Information Systems

Fall Semester 2023-2024

Continuous Assessment Test – II

Programme Name & Branch : MCA

Course Name & code: PMCA501L Data Structures and Algorithms

Class Number (s): VL2023240106164, VL2023240106168, VL2023240106145

Faculty Name (s): Dr.Seetha.R, Dr. Mythili.N, Dr.Iyapparaja.M

Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s): ANSWER ALL THE QUESTIONS

Q.No.	Question	Max Marks
1.	Write a pseudo code to (i) create a Doubly Circular Linked List (3) (ii) count the number of nodes in it(3) (iii) print its element in reverse order(4)	10

2.	a. Derive the time complexity of the following algorithm using backward substitution and verify using Master's theorm (6)
	algorithm RecursiveSum(a, n)
	{if n <= 0 then
	return 0;
	else
	return RecursiveSum(a, n-1) + a[n];}
	
	b. Determine the time complexity of following codes (2+2)
	(1) int main()
	{cout << "Hello World";
	return 0;}
	
	(2) void fun(int n)
	{for (int i = 0; i <= n / 3; i++)
	for (int j = 1; j <= n; j = j + 4)
	cout << "Hello world";}
		10

3.	Using a divide and conquer search technique trace the steps for finding 30 and 1000 from the given set of following elements and write a recursive algorithm for it. **100 200 300 400 500 600 700 800 900 1000**	10
4.	a. Is Quick sort a stable sort? Justify (4) b. Using a non comparison sort, sort the following elements **1000, 110, 100, 111, 001, 1001, 011, 101, 010, 1010** (6)	10
5.	a. Derive the best case, average case and worst case time complexity of linear search with an example. (5) b. (i) Why do we analyse algorithms? (2.5) (ii) How do we measure its efficiency? (2.5)	10

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Slot : F1+TF1

School of Computer Science Engineering and Information Systems

Fall Semester 2023-2024

Continuous Assessment Test – II

Programme Name & Branch: MCA

Course Name & code : Data Communication and Networking (PMCA505L)

Class Numbers(s) : VL2023240106191, VL2023240106192, VL2023240106195

Faculty Name (s) : Prof. ArivuSelvan K, Prof. Asis Kumar Tripathy & Prof. Ushapreethi P

Exam Duration : 90 Min. **Maximum Marks: 50**

Answer all the Questions:

Q.No.	Question	Max Marks
1.	a. Hosts A and B are connected to each other via router R. The bandwidth from A to R is 10Mbps, and the bandwidth from R to B is 5Mbps. Assume host A sends a 30KB file to host B. Assume the file is divided into two packets, p1 and p2, where p1 has a length of 10KB, and assume the packets are sent back-to-back. i) What is the difference between the transmission times of the first and the second packet at host B? ii) What is the propagation time if the distance between the A and B is 16,000 km? Assume the propagation speed to be 2.4×10^3 ms. b) A digital signal has eight levels and sends the data 1011101000010100000 in 1 second; Draw the digital signal as graph with respect to time and amplitude.	5 5
2.	a. Five channels, each with a 200-kHz bandwidth, are to be multiplexed together. Show the configuration, using the frequency domain and identify the minimum bandwidth of the link if there is a guard band of 5 kHz between the channels to prevent interference? b. Draw the Direct Sequence Spread Spectrum for the following data with 4-bit spread code 1101. Data : 101011101101	5 5
3	Consider the following parameters for a switching network: N= number of hops between two given end systems L= message length in bits B= data rate in bits per second (bps), on all links P= packet size H= overhead (header) bits per packet S= call setup time (circuit switching or virtual circuit) in seconds D= propagation delay per hop in seconds For N=5, L=6400, B=50000, P=2048, H=16, S=0.3, D=0.004, compute the end-to-end delay for circuit, virtual-circuit, and packet switching. Assume there are no acknowledgements, and no queuing delay.	10

4.	A multiplexer combines three 200-kbps channels using a time slot of 3 bits. a) Show the output with three arbitrary inputs. b) What is the frame rate? c) What is the frame duration? d) What is the bit rate? e) What is the bit duration?	10
5.	a. Consider the Virtual circuit with three switches S1, S2, S3 with VCI values 22, 36, 67 and two end systems A,B with VCI values 34,81 respectively. i) Draw the virtual circuit with request frame and table entry for setup request from A to B via the switches s2, s1, s3. ii) Draw the virtual circuit with acknowledgement frame and table entry for acknowledgement from B to A for the request given in question i. b. i) Calculate the 4 bits-checksum of the following message. 10101111010100001010 ii) A 2B/3B block coding follows parity check with 2^k data words and 2^n code words, Consider k = 2, n = 3 ; find valid and invalid code words.	6 4

**********All the best**********

VIT

Vellore Institute of Technology

School of Computer Science Engineering and Information Systems (SCORE)
FALL 2023-2024
Continuous Assessment Test (CAT – II)
Programme Name & Branch: MCA
Course Name & Code: PMCA506L Cloud Computing
Slot: C1 Class Number: VL2023240106196,VL2023240106200,VL2023240106198
Faculty Name: Dr. DAPHNE LOPEZ, Dr. SUBHASHINI R, Dr. NADESH R.K

Exam Duration: 90 Mins **Maximum Marks: 50**

Answer all the Questions (5 *10 = 50 Marks)

1. Virtualization enables more efficient utilization of physical computer hardware and allows a greater return on an organization's hardware investment." -Justify with a Scenario.

2. Is it possible to move workload of multiple running virtual machines on a single physical machine? If so, elaborate the phases with appropriate illustrations.

3. Identify the kind of virtualization that provide better performance for an application that heavily uses system calls to manage a complex external device? Elaborate your answer with suitable use cases.

4. A multinational insurance company tries to get the feedback of clients' real time data about its new venture in India. Elaborate on the programming model for data processing.

5. Climate change prediction has become an important science, fundamental to the success of agriculture, virtually every other aspect of human enterprise. If you are to design a Hadoop Distributed File System, what are the requirements that would be addressed?

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VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES

Fall Semester 2023-2024

Continuous Assessment Test – II

Programme Name & Branch :MCA

Slot:D1+TD1

Course Name & code: PMAT501L-Probability and Statistics

Class Number (s):6404,6405,6406

Faculty Name (s): Dr.G.MOKESH RAYALU, Dr. NALLIAH M, Dr.GOWSALYA M

Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s): Scientific calculator & Statistical Tables are allowed in the examination

<table>
<tr><th>Q.No.</th><th>Question</th><th>Max Marks</th></tr>
<tr><td>1.</td><td>Suppose you are working on a machine learning project to predict the performance of students on an exam based on the number of hours they studied and their previous test scores. You have collected data for 10 students, and you want to calculate the Pearson correlation coefficient between these two variables to understand their relationship.
<table>
<tr><td>Student</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>Hours studied (X)</td><td>2</td><td>3</td><td>1</td><td>4</td><td>2.5</td><td>3.5</td><td>2</td><td>5</td><td>1.5</td><td>4.5</td></tr>
<tr><td>Previous test scores (Y)</td><td>80</td><td>85</td><td>75</td><td>90</td><td>78</td><td>88</td><td>82</td><td>92</td><td>70</td><td>95</td></tr>
</table>
Calculate the Pearson correlation coefficient (r) between the hours studied (x) and the previous test scores (y) using the Pearson correlation formula. Explain what the value of r indicates in this context</td><td>10</td></tr>
<tr><td>2.</td><td>You are a medical researcher studying the relationship between a patient's age (in years) and their blood pressure (in mmhg). You have collected data from 10 patients given below and hence estimate blood pressure of a patient whose age is 50 years .
<table>
<tr><td>Patient</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>Age(X)</td><td>32</td><td>45</td><td>29</td><td>54</td><td>40</td><td>63</td><td>28</td><td>59</td><td>35</td><td>48</td></tr>
<tr><td>Blood Pressure(Y)</td><td>120</td><td>135</td><td>118</td><td>142</td><td>130</td><td>150</td><td>116</td><td>145</td><td>125</td><td>138</td></tr>
</table></td><td>10</td></tr>
</table>

3.	In a multiple-choice quiz, each question has four answer choices, of which only one is correct. Sarah, who hasn't studied at all, decides to guess on each of the 10 questions. What is the probability that she answers the following: a) Exactly 3 questions correctly. b) More than 7 questions correctly. c) At least 6 questions correctly. d) Less than 2 questions correctly. e) What is the expected number of questions she will answer correctly?	10
4.	A call center receives an average of 20 calls per hour. Let X be the number of calls the call center receives in a given hour, following a Poisson distribution. a) Calculate the probability that the call center receives exactly 15 calls in an hour. b) Determine the probability that the call center receives more than 7 calls in an hour. c) Find the mean and standard deviation of the number of calls received in an hour. d) Determine the probability that the call center receives no calls .	10
5.	Suppose the heights of a population of adults follow a normal distribution with a mean height (μ) of 170 cm and a standard deviation (σ) of 10 cm. a) What is the probability that a randomly selected adult from this Population is shorter than 160 cm? b) What is the probability that a randomly selected adult from this Population is taller than 180 cm? c) If a sample of 50 adults is taken from this population, what is the probability that the sample mean height is greater than 175 cm? d) If a sample of 50 adults is taken from this population, what is the probability that the sample mean height is between 168 cm and 172 cm?	10