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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU

V Semester B. E. Examinations Nov/Dec-16

Computer Science and Engineering

PROBABILITY, STATISTICS AND QUEUING (ELECTIVE)*Time: 03 Hours**Maximum Marks: 100***Instructions to candidates:**

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B.
3. Use of statistical tables permitted.

PART-A

1	1.1	It is found that in manufacturing a certain article, defects of one type occur with probability 0.15 and defects of other type occur with probability 0.08. Assume independence between the two types of defects. Find the probability that an article chosen at random has exactly one type of defect given that it is defective.	02
	1.2	To estimate the average time it takes to assemble a certain computer component, the industrial engineer at an electronics firm timed 40 technicians in the performance of the task, getting a mean of 12.73 minutes and a standard deviation of 2.06 minutes. Use the given data to construct a 98% confidence interval for the true average time it takes to assemble the computer component.	02
	1.3	In certain experiments, the error X made in determine the solubility of a substance is a random variable having the uniform density function in the interval $(-0.023, 0.023)$. What is the probability that such an error will be between 0.01 & 0.0145?	01
	1.4	A manufacturer of car batteries claims that the life of his batteries is approximately normally distributed with a standard deviation equal to 0.9 years. If a random sample of 10 of these batttries has a standard deviation of 1.2 years, do you think that $\sigma > 0.9$ year? Use a 0.05 level of significance.	02
	1.5	State Chapman-Kolmogorov theorem.	01
	1.6	If the customers arrive at a bank according to a Poisson process with mean rate of $2/\text{min}$, find the probability that no customer arrives in one minute interval.	01
	1.7	A student study habits are as follows: If he studies one night, he is 70% sure not to study the next night. On the other hand, if he does not study one night, he is 40% sure not to study the next night as well. In long run, how often does he study?	02
	1.8	What are the characteristics of a Queuing system?	02
	1.9	The time required to rapair a machine is an exponentially distributed random variable with mean 0.5hours . What is the probability that a repair time takes at least $12\frac{1}{2}\text{hours}$ given that its duration exceeds 11hours ?	01
	1.10	A real estate man has 8 master keys to open several new houses. Only one master key can open a specific house. If 45% of the houses are usually left unlocked, what is the probability that the man can enter a specific house, if he selects 3 keys at random?	02
	1.11	Discuss classification of states of Markov chain.	02
	1.12	Discuss Birth-Death processes.	02

PART-B

2	a	The probability that regularly scheduled flight departs on time is 0.83. The probability that it arrives on time is 0.82 and the probability that it arrives and departs on time is 0.78. Find the probability that a plane: i) Arrives on time given that it departed on time, ii) Departs on time given that it arrived on time, and iii) Arrives on time given that it did not depart on time.	04
	b	At an electronics firm, it is known from past experience that the probability a new worker attended the company's training program meets the production quota is 0.86. The corresponding probability for a new worker who did not attend the training program is 0.35. It is also known that 80% of all new workers attend the company's training program. Find probability that a new worker who met the production quota would have attended the company's training program?	04
	c	Two random variables X & Y have joint density function given by: $f(x,y) = \begin{cases} \left(\frac{3}{4}\right) + xy, & 0 < x < 1, \quad 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$ Find: i) $h\left(\frac{y}{x}\right)$ ii) Expectation of y given $x = 0.25$	08
		OR	
3	a	The time to check out and process information at an office supplies website can be modeled as a random variable with mean 63 <i>seconds</i> and variance 81 <i>seconds</i> . If the sample mean \bar{X} will be based on a random sample $n = 36$ times, what can we assert about the probability of getting a sample mean greater than 66.75 <i>seconds</i> , if we use the central limit theorem?	05
	b	The following are the times between six calls for an ambulance (in certain city) and the patient's arrival at the hospital: 27, 15, 20, 32, 18 & 26 minutes. Use these figures to judge the reasonableness of the ambulance services claim that it takes on the average 20 minutes between the call for an ambulance and the patient's arrival at the hospital.	07
	c	A random sample of 10 observations is taken from a normal population having the variance 42.5. Find approximately the probability of obtaining a sample standard deviation S between 3.14 & 8.94.	04
4	a	The claim that the variance of a normal population is 21.3 is rejected if the variance of a random sample of size 15 exceeds 39.74. What is the probability that the claim will be rejected even though the variance is 21.3?	03
	b	A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of \$487 with a standard deviation of \$48. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between \$472 and \$502?	05
	c	The following are the weights, in decagrams, of 10 packages of grass seed distributed by a certain company: 46.4, 46.1, 45.8, 47.0, 46.1, 45.9, 45.8, 46.9, 45.2 & 46.0. Find a 95% confidence interval for the variance of all such packages of grass seed distributed by this company, assuming a normal population.	08
		OR	

5	a	To test a paint manufacturer's claim that the average drying time of his new "fast-drying" paint is $\mu = 20$ minutes, a random sample of 36 boards is painted with his new paint and his claim is rejected if the mean drying time $\bar{X} > 20.5$ minutes. Find i) The probability of type I error; ii) The probability of type II error, when $\mu = 21$ minutes (assume that $\sigma = 2.4$ minutes).	06
	b	In order to test the durability of a new paint, a highway department had test strips painted across heavily travelled roads in 15 different locations. If on an average the test strips disappeared after they had been crossed by 146,692 cars with standard deviation of 14,380 cars, construct a 99% confidence interval for the true average number of cars it takes to wear off the paint. Assume a normal population.	05
	c	Two independent sampling stations were chosen for some study, one located downstream from the aid mine discharge point and the other located upstream. For 12 monthly samples collected at the downstream station the species diversity index had a mean value 3.11 and a standard deviation 0.771, while 10 monthly samples collected at the upstream had a mean index value 2.04 and a standard deviation 0.448. Find a 95% confidence interval for the difference between the population means for the two locations, assuming that the populations are approximately normally distributed with equal variances.	05
6	a	On the average, a submarine on patrol sights 6 enemy ships per hour. Assuming that the number of ships sighted in a given length of time is a Poisson variate, find the probability of sighting i) 6 ships in the next half an hour, ii) 4 ships in the next two hours, and iii) At least 1 ship in the next 15 minutes.	06
	b	State and prove Chernoff's bounds. Also find Chernoff's bounds for an exponential distribution.	05
	c	If immigrants to area A arrive at a Poisson manner at the rate of 6 per week, and if each immigrant is of Bangladesh decent with probability $\frac{1}{12}$, then what is the probability that 1 Bangladesh decent will immigrate to area A during the 6 week's time? What is the probability that no non-Bangladesh decent will immigrate to area A during the month of February?	05
OR			
7	a	State and prove Markov's Inequality. Also derive Chebyshev's inequality from Markov's inequality.	05
	b	Suppose that it is known that the number of items produced in a factory during a month is a random variable with mean 500, what can be said about the probability that this month's production exceeds 1000? If the variance of the month's production is known to be 100, then what can be said about the probability that this month's production will be between 400 and 600?	05
	c	Suppose that people immigrate into a territory at a Poisson rate 5 per day. i) What is the expected time until the 12 th immigrant arrives? ii) What is the variance time until the 15 th immigrant arrives? iii) What is the probability that the elapsed time between 14 th and 15 th arrival exceeds 4 days?	06

8	a	Cars arrive at a petrol pump, having one petrol unit, in Poisson fashion with an average of 10 cars per hour. The service time is distributed exponentially with a mean of 3 minutes. Find: i) Average number of cars in the system ii) Average waiting time in the queue iii) Average queue length iv) The probability of 2 cars in the system	08
	b	A petrol pump station has 4 pumps. The service times follow the exponential distribution with a mean of 6 minutes and cars arrive for service in a Poisson process at the rate of 30 cars per hour. i) What is the probability that an arrival would have to wait in line? ii) Find the average waiting time, average time spent in the system and the average number of cars in the system.	08
OR			
9	a	A telephone exchange has two long distance operators. The telephone company find that during the peak load, long distance calls arrive in a Poisson fashion at an average rate of 15 per hour. The length of the service on these calls is approximately exponentially distributed with mean length 5 minutes. i) What is the probability that a subscriber will have to wait for his long distance call during the peak hour of the day? ii) What is the expected waiting time for the subscriber?	08
	b	A storage system consists of three disk drives sharing a common queue. The average time to service an I/O request is 50 milliseconds. The I/O requests arrive to the storage system at the rate of 30 requests per second. Using an $M/M/3/4$ for this system, determine: i) The probability of the system being idle ii) The average number of jobs in the system.	08
10	a	There are 2 white marbles in urn A and 3 red marbles in urn B . At each step of the process, a marble is selected from each urn and the 2 marbles selected are interchanged. Let the same a_i of the system be the number of red marbles in urn A after i changes. What is the probability that there are 2 red marbles in urn A after 3 steps? In the long run, what is the probability that there are 2 red marbles in urn A ?	08
	b	A man either drives a car or catches a train to go to office each day. He never goes 2 days in a row by train but if he drives one day, then the next day he is just as likely to drive again as he is to travel by train. Now suppose that on the first day of the week, the man tossed a fair dice and drove to work if and only if a 5 or a 6 appears. Find i) The probability that he takes a car on the third day, ii) The probability that he catches a train in the long run.	08
OR			
11	a	Explain in detail the Monte-Carlo method.	08
	b	Is the Markov chain with transition matrix $P = \begin{bmatrix} 0 & 2/3 & 1/3 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{bmatrix}$ irreducible? Also find the corresponding time reversible Markov chain.	08

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R. V. COLLEGE OF ENGINEERING

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V Semester B. E. Examinations Nov/Dec-16

Computer Science and Engineering

OBJECT ORIENTED ANALYSIS AND DESIGN (ELECTIVE)*Time: 03 Hours**Maximum Marks: 100**Instructions to candidates:*

4. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
5. Answer FIVE full questions from Part B.

PART-A

1	1.1	What is software development methodology?	01
	1.2	_____ + _____ = program	02
	1.3	Differentiate between verification and validation.	02
	1.4	What is Model? Give an example.	02
	1.5	What is antipattern?	01
	1.6	What is Framework?	01
	1.7	Write the <i>UML</i> notation used to represent visibility of class members.	02
	1.8	Write the guidelines for identifying association.	02
	1.9	Differentiate between coupling and cohesion.	02
	1.10	What is classification?	01
	1.11	What is transaction in use case model? When it will be triggered?	02
	1.12	List the types of attributes.	02

PART-B

2	a	Explain why object orientation is required.	08
	b	Explain object oriented features and compare to traditional system of programming.	08
OR			
3	a	Explain prototyping and its categories.	10
	b	Explain the benefits of modeling.	06
4	a	Explain the following terms with example: i) Qualifier; ii) Multiplicity; iii) Composition; iv) Aggregation; v) Association.	10
	b	Draw a use-case diagram for a helpdesk.	06
OR			

5	a b	Write a sequence diagram for withdrawal in <i>ATM</i> machine. What is <i>CRC</i> ? Explain its process.	08 08
6	a b	Explain the guidelines for defining attributes with an example. What is unnecessary association? How do you identify unnecessary association? Justify with example. OR	10 06
7	a b	Explain the approaches for identifying classes. List the guidelines for naming a class.	12 04
8	a b	Explain the activities involved in object oriented design process. Briefly explain object oriented design axioms. OR	10 06
9	a b	What is corollary? Explain the corollaries derived from design axioms. Briefly explain <i>OCL</i> .	10 06
10	a b	What is pattern? Explain pattern categories. Explain the different parameters of design pattern template. OR	08 08
11	a b	What is a pattern? Explain guidelines for capturing patterns. Describe the working of whole-part pattern.	08 08

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-16
Computer Science and Engineering
INTRODUCTION TO MACHINE LEARNING (ELECTIVE)

*Time: 03 Hours**Maximum Marks: 100**Instructions to candidates:*

6. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
7. Answer FIVE full questions from Part B.

PART-A

1	1.1	Give the equation for Euclidean norm.	02
	1.2	Define generalization.	02
	1.3	Define linearly separable.	02
	1.4	Give the equation for generalized linear discriminant function.	02
	1.5	Define parizon windows.	02
	1.6	Give the equation for convergence of the mean.	02
	1.7	Define threshold weight.	02
	1.8	Define two categories case.	02
	1.9	Give equation heuristic global cost function.	02
	1.10	What are the assumptions of Baye's classifier?	02

PART-B

2	a	Mention basic probability notations and discuss their purpose of usage.	08
	b	Define Baye's laws. Illustrate with one example the application of Baye's law.	08
OR			
3	a	Show how decision rule is used for misclassification rate.	08
	b	Write a note on uniformation theory.	08
OR			
4	a	Explain the use of Bayesian Decision theory in developing the classifiers.	08
	b	Discuss the working of minimum error rate classification.	08
OR			
5	a	Explain the use of discriminant function for deriving the normal density.	08
	b	Explain the back propagation algorithm.	08

6	a	Discuss the propagation of metrics and nearest neighbor classification.	08
	b	Explain the generalized linear discriminant function.	08
OR			
7		Discuss and illustrate the applications of:	
		a) Fuzzy classification; b) Relaxation procedures.	16
8	a	Explain fuzzy k-means clustering.	08
	b	Write an note on: i) Graph theoretic methods; ii) The problem of validity.	08
OR			
9	a	Discuss maximum likelihood estimates.	08
	b	Explain criterion functions for clustering.	08
10	a	Explain the work flow of collaborative filtering system.	08
	b	Propose a technique to find similar documents from a document repository.	08
OR			
11	a	Discuss machine learning method for spam classification.	08
	b	Write a note on clustering documents.	08

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-16
Computer Science and Engineering
ARTIFICIAL INTELLIGENCE (ELECTIVE)

*Time: 03 Hours**Maximum Marks: 100**Instructions to candidates:*

8. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
9. Answer FIVE full questions from Part B.

PART-A

1	1.1	What is a rational agent?	02
	1.2	What is iterative depending search?	02
	1.3	What is Hill-climbing search?	02
	1.4	What are semantic networks?	02
	1.5	Distinguish between Active reinforcement learning and a passive learning agent.	02
	1.6	What is the use of unification?	02
	1.7	What is Baye's rule? Give example.	02
	1.8	Distinguish between weak AI hypothesis and strong AI hypothesis.	02
	1.9	What is machine learning?	02
	1.10	Define knowledge representation.	02

PART-B

2	a	What is an AI? Give an overview of any three AI application areas.	08
	b	Give the brief history of AI.	08
		OR	
3	a	What are production systems? Explain the contents of production systems in brief.	08
	b	Write the algorithm for function unify.	08
4	a	Explain briefly with examples, predicate calculus as a language for representing knowledge.	08
	b	Explain the simple hill climbing algorithm.	08
		OR	
5	a	Write an algorithm for best first search and illustrate with an example.	08
	b	Explain blackboard systems with supporting sketches or examples.	08

6	a	Explain Baye's rule with suitable example and also give its advantages and disadvantages.	08
	b	Explain with a neat diagram the basic structure of an expert system.	08
OR			
7	a	What is fuzzy logic? Explain the importance of fuzzy logic by providing necessary examples.	08
	b	Explain Bayesian networks with examples.	08
8	a	What is learning? Explain learning by advice.	08
	b	Explain learning from examples in detail.	08
OR			
9	a	Explain knowledge based learning with suitable examples.	08
	b	Write short notes on: i) Neural networks ii) Genetic algorithms.	04 04
10	a	Explain Agent architecture with supporting sketches.	08
	b	What are the difficulties involved in developing AI algorithms? Discuss with examples.	08
OR			
11	a	Explain briefly future and present AI.	08
	b	Write short notes on: i) ETHICS of AI ii) Agents types.	04 04

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V Semester B. E. Examinations Nov/Dec-16

Computer Science and Engineering

GRAPH THEORY AND APPLICATIONS (ELECTIVE)

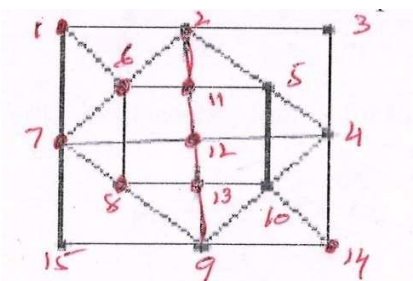
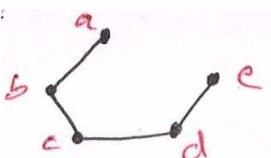
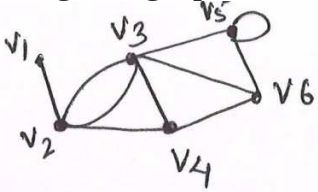
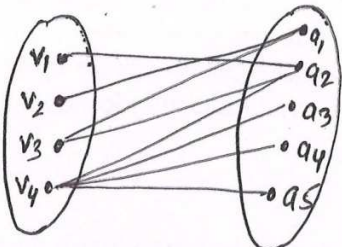
Time: 03 Hours

Maximum Marks: 100

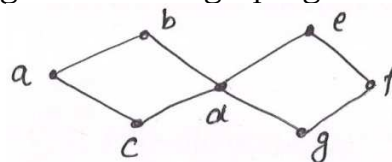
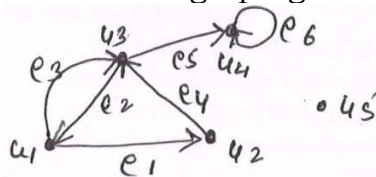
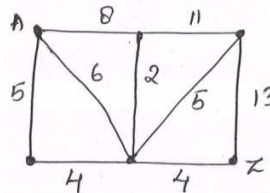
Instructions to candidates:

10. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
11. Answer FIVE full questions from Part B.

PART-A

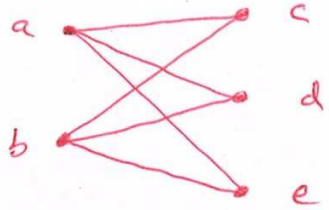
1	1.1	What is the dimension of the hypercube with 524288 edges?	01
	1.2	For which n does K_n have an Euler trail but not an Euler circuit?	01
	1.3	Show that the complete graph K_n is not a tree when $n > 2$.	02
	1.4	Verify Euler's formula for the planar graphs shown below.	
			01
	1.5	Find the chromatic polynomial for the graph given below. What is its chromatic number?	
			02
	1.6	Find perfect matching for a given graph.	
			01
	1.7	Show that the bipartite graph shown below do not have a complete matching from V_1 to V_2 .	
			02


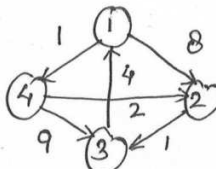
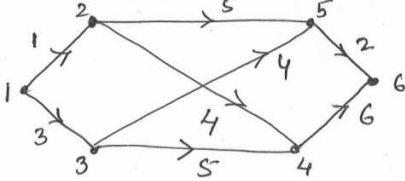
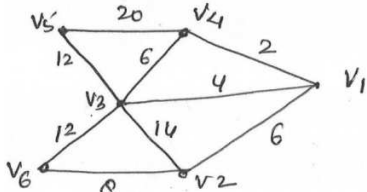
1.8	Determine the order $ V $ of a cubic graph with 9 edges.	02
1.9	In a weighted graph, assume that the shortest path from a source 's' to a destination 't' is correctly calculated using a shortest path algorithm. If the weight of every edge is increased by 1, what will be the shortest path?	02
1.10	Find the maximum possible flow between A and Z in the network shown below:	02
1.11	Write the adjacency matrix for the graph given below:	02
1.12	Find the DFS spanning tree for the graph given below.	02



PART-B

2	a	Define the following with an example: i) Induced sub graph. ii) Homomorphism in graph.	05
	b	If G is a bipartite graph, show that G has no cycle of odd length.	04
	c	Explain disconnected graph and prove that a simple graph with n vertices and k components can have at most $(n - k)(n - k + 1)/2$ edges.	07
OR			
3	a	Prove that two simple graph G_1 and G_2 are isomorphic if and only if their complements $\overline{G_1}$ and $\overline{G_2}$ are isomorphic.	05
	b	Let $G = (V, E)$ be a simple graph of order $ V = n$ and size $ E = m$. If G is a bipartite graph, then prove that $4m \leq n^2$.	06
	c	Define isomorphism of two graphs. Verify whether the following graphs are isomorphic to each other?	05
4	a	Prove that in a tree with two or more vertices there are at least two leaves.	04

5	b	If a tree T has four vertices of degree 2, one vertex of degree 3, two vertices of degree 4 and one vertex of degree 5, find the number of leaves in T .	04
	c	Exhibit the following: i) A graph which has both an Euler circuit and a Hamilton cycle. ii) A graph which has an Euler circuit but no Hamilton cycle. iii) A graph which has a Hamilton cycle but no Euler circuit. iv) Neither Eulerian nor Hamiltonian.	08
	OR		
	a	Show that if a tree has exactly two pendant vertices, the degree of every other vertex is two.	04
6	b	Is there a graph with even number of vertices and odd number of edges that contain an Euler circuit?	04
	c	Define the following: i) Tournament of digraph; ii) Acyclic digraph; iii) m -ary Tree; iv) Minimum Cost spanning tree.	08
	a	Show that for a connected planar graph G with n vertices and m edges has exactly $(m - n + 2)$ regions in all of its diagrams.	05
7	b	Define the following: i) Meneger's Theorem. ii) Blocks in a separable graph. iii) Vertex cover.	06
	c	Show that for a connected graph G , if C is a cycle in G and S is an edge cut of G , then $ E(C) \cap S $ is always even.	05
	OR		
	a	Prove that if B_1 and B_2 are two distinct blocks in a graph G , then $B_1 \cap B_2$ is either empty or consists of a single vertex.	05
8	b	Define the following with example: i) Stable matching. ii) Dominating sets.	06
	c	Prove that, every simple, connected planar graph contains a vertex of degree five or less.	05
	a	Consider the graph shown below:  Let λ denote the number of colors available to properly color the vertices of the above graph.	

	<p>Find:</p> <ol style="list-style-type: none"> How many proper coloring of the graph have vertices a, b colored the same. How many proper coloring of the graph have vertices a, b colored with different colors. The chromatic polynomial of the graph. <p>Define:</p> <ol style="list-style-type: none"> Chromatic polynomial of a graph. Power of graph. <p>Show that for any simple graph G with a maximum degree $\Delta(G)$, we have $\psi(G) \leq \Delta(G) + 1$.</p> <p style="text-align: center;">OR</p> <p>9 a Prove that a graph G is a 2-chromatic if and only if it is null bipartite graph.</p> <p>b Determine the chromatic polynomials for the graph shown below:</p>  <p>c Define the following:</p> <ol style="list-style-type: none"> Chordal graph. Multipartite graph. Edge coloring of graph. 	<p>08</p> <p>04</p> <p>04</p> <p>04</p> <p>08</p>
10	<p>a Run the Floyd – Warshall algorithm on the weighted graph displayed in figure. Show the matrix $D^{(k)}$ that results each iteration.</p>  <p>b Explain Ford-Fulkerson algorithm with example.</p> <p style="text-align: center;">OR</p>	<p>08</p> <p>08</p>
11	<p>a Apply Dijkstra's algorithm to the weighted graph shown below and demonstrate the shortest distance from the vertex 1 to each of the other five vertices in the graph.</p>  <p>b Find the minimum cost spanning tree in the following graph using Prim's algorithm.</p> 	<p>08</p> <p>08</p>

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V Semester B. E. Examinations Nov/Dec-16
Computer Science and Engineering
JAVA AND JEE (ELECTIVE)

*Time: 03 Hours**Maximum Marks: 100**Instructions to candidates:*

12. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
13. Answer FIVE full questions from Part B.

PART-A

1	1.1	_____ operator is used to allocate memory to array variable in Java.	01
	1.2	What will this code print? <pre>int arr[] = new int [5]; System.out.print (arr);</pre>	02
	1.3	What is the output of this program? <pre>class equality { int x; int y; boolean isequal () { return (x = y); } } class Output { public static void main (String args []) { equality obj = new equality (); obj.x = 5; obj.y = 5; System.out.println(obj.isequal); } }</pre>	02
	1.4	_____ keyword is used to refer to member of base class from a sub class.	01
	1.5	_____ package stores all the standard java classes.	01
	1.6	_____ interface is implemented by Thread class.	01
	1.7	What is the output of this program? <pre>class multithreaded_programming { public static void main (String args []) { Thread t = Thread.currentThread(); t.setName("New Thread"); System.out.println(t); } }</pre>	02

1.8	_____ keyword must be used to handle the exception thrown by try block in some rational manner.	01
1.9	_____ are types of multitasking.	02
1.10	What is the output of this program? <pre>import java.util.*; class Maps { public static void main (String args []) { TreeMap obj = new TreeMap (); obj.put("A",new Integer(1)); obj.put("B",new Integer(2)); obj.put("C",new Integer(3)); System.out.println(obj.entrySet ()); } }</pre>	02
1.11	_____ JDBC driver type(s) can be used in either applet or servlet code.	02
1.12	_____ many copies of a JSP page can be in memory at a time.	01
1.13	_____ class handles the actual data encryption.	01
1.14	_____ function retrieves the name of the authentication scheme in servlets.	01

PART-B

2	a	What is package? Create a user defined package to find all roots of quadratic equation. Write a program to use this package.	08
	b	With syntax, explain the purpose of interfaces. Illustrate with an example.	08
		OR	
3	a	Explain data type conversion and casting feature of Java with an example.	06
	b	Discuss any six commonly used methods of Thread class.	06
	c	Illustrate hierarchy of collection framework with the help of diagram.	04
4	a	Why exception handling. Implement a stack class and raise use defined exceptions for stack underflow and overflow operations.	10
	b	Write a Java program that creates two threads object of Thread class. Where one thread asks the user to enter address along with pin code. Second Thread to check pin code is not less than 5 digits and display the same.	06
		OR	
5	a	Write a Java program with class Temperature that converts temperature between Fahrenheit (F) and Celsius (C). The formulas for conversion between the two units are: <ul style="list-style-type: none"> $Fahrenheit = (Celsius * 1.8) + 32$ $Celsius = (Fahrenheit - 32) * 0.5556$ The program should throw an exception of the type NumberFormatException if the number of degrees is not a legal floating point number and give suitable feedback.	08

	b	Create two threads “FirstThread” and “SecondThread”. Both of these threads will display numbers 1,2,3,...10 with a one second delay in displaying the next number. ThreadDemo class will be starting these threads “FirstThread” and “SecondThread”.	08
6	a	Discuss Java based connectivity. Write a program to explain <i>JDBC</i> connectivity for employee payroll calculation.	08
	b	Illustrate basic HashMap functionalities like creating object, adding entries, getting values by passing key, checking hashmap is empty or not, deleting an element and size of the HashMap.	08
		OR	
7	a	Discuss any four differences between ArrayList and LinkedList.	08
	b	Write a Java program using collections to enter employee details. Sorts the array list of Employee objects based on highest salary using Collecitons.sort ()method andcomparator.	08
8	a	Write a <i>JSP</i> to create and read cookies named user id that stores the value <i>JB007</i> .	06
	b	Create a <i>RMI</i> based client-server application to convert a given decimal number into binary, octal and hexadecimal on the remote site and send back the result to client-server.	10
		OR	
9	a	Explain the working of servlet with an example to display Hello.	08
	b	What is the difference between servlet and <i>JSP</i> ? Explain different types of <i>JSP</i> tags.	08
10	a	Discuss the difference between native class and native methods in Java.	08
	b	What are the problems with native methods in Java?	04
	c	What are Java native <i>APIs</i> ?	04
		OR	
11	a	Discuss the steps to integrate native code with program in Java.	08
	b	Explain the steps involved in mapping argument types in native method declaration to Native programming language.	08

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-16
Computer Science and Engineering
ADVANCED ALGORITHMS (ELECTIVE)

Time: 03 Hours**Maximum Marks: 100****Instructions to candidates:**

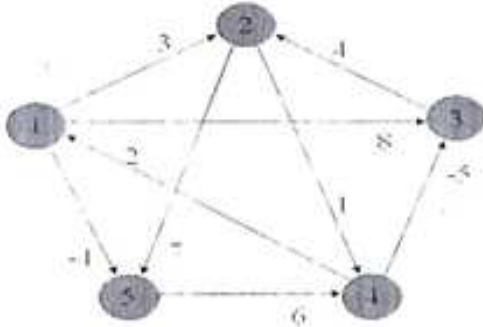
1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B.

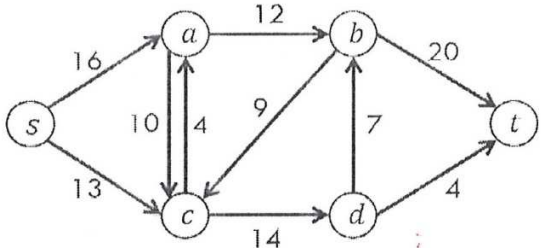
PART-A

1	1.1	Compute the largest value of ' a ' such that algorithm B with running time $T(n) = aT(n/4) + n^2$ is asymptotically faster than algorithm A with running time $T(n) = 7T(n/2) + n^2$ is _____.	02
	1.2	The time complexity of the Naïve string matching algorithm, where m is the length of the pattern and n is the length of the text is given by _____.	01
	1.3	Consider a sequence of $PUSH, POP$ and $MULTIPOP$ operations on an initially empty stack. Calculate the amortized cost of the above various operations using potential method of analysis.	02
	1.4	If $S = \{1, 2, 7, 14, 98, 343, 686, 2409, 2793, 16808, 17206, 117705, 117993\}$ and $t = 138457$, then the subset S' is given as _____.	01
	1.5	What is a Binomial queue?	01
	1.6	A longest path through a directed acyclic graph, which corresponds to the longest time to perform any sequence of job is _____.	01
	1.7	Convert the given multiple-source, multiple-sink, maximum-flow problem into a problem with a single source and single sink given in figure 1.7	
		<p style="text-align: center;">Fig 1.7</p>	02

1.8	Find the <i>GCD</i> of 621 and 483.	02
1.9	Find the polynomial for the dataset $\{(-1, -4), (0, -5)\}$ to interpolate.	02
1.10	The residual capacity of an augmenting path p is given by _____.	01
1.11	What are Carmichael numbers?	01
1.12	Write one of the advantage of the <i>POLLARD – RHO</i> procedure related to memory locations.	02
1.13	The parallel <i>FFT</i> circuit has a depth of _____. Write the time complexity notation for depth of parallel <i>FFT</i> circuit.	01
1.14	Complex roots of unity can be evaluated and interpolated polynomials in _____ time.	01

PART-B

2	a	Use the substitution method to prove a tight asymptotic lower bound on the solution to the recurrence $T(n) = 4T(n/2) + n^2$.	08
	b	Suppose we perform a sequence of n operations on a data structure in which the i^{th} operation costs i , if i is an exact power of 2, and 1 otherwise. Use aggregate method of analysis to determine the amortized cost per operation.	08
OR			
3	a	What is recurrence? Use a recursion tree to determine a good asymptotic upper bound on the recurrence $T(n) = 3T(n/4) + cn^2$. Also determine the cost for the entire tree.	08
	b	Explain potential method of amortized analysis and illustrate the same using stack with multipop as an example.	08
4	a	Discuss Rabin Karp algorithm for string matching with an algorithm.	08
	b	Use Johnson's algorithm to find the shortest paths between all pairs of vertices in the graph given in figure 4b.	
			
Fig 4b			08
OR			
5	a	Compute the prefix function π for the pattern <i>ababaca</i> with the help of Knuth-Morris-Pratt algorithm.	08
	b	Explain the working procedure and algorithm of Bellman Ford for solving the single source shortest path problem.	08

6	a	Build a red-black tree by inserting these nodes in the following order: 10, 85, 15, 70, 20, 60, 30, 50, 65, 80, 90, 40, 5, 55.	08
	b	Apply Ford-Fulkerson algorithm for the given graph shown in fig 6b and also discuss the steps.	08
 <p style="text-align: center;">Fig 6b</p>			08
OR			
7	a	Write and explain pseudocode for Left-Rotate on red black trees, which preserve the binary search tree property with an example.	08
	b	State and prove Max-flow min-cut theorem.	08
8	a	Illustrate Modular Exponentiation procedure to compute $a^c \text{ mod } n$ as c is increased by doublings and incriminations from for 0 to b .	08
	b	Discuss Miller-Rabin randomized primality test with the help of pseudocode and example.	08
OR			
9	a	Demonstrate with procedure, the extended form of Euclid's algorithm for the given equation $d = GCD(a, b) = ax + by$. Apply <i>EXTENDED – EUCLID</i> to compute $GCD(99, 78)$.	08
	b	Explain RSA public-key cryptosystem. Now consider an <i>RSA</i> key set with $p = 11, q = 29$ and identify the value of d used in the secret key. What is the encryption of the message $M = 100$?	08
10	a	With procedure and example, discuss iterative <i>FFT</i> implementation.	08
	b	Draw the parallel <i>FFT</i> circuit which computes the <i>FFT</i> on n inputs for $n = 8$.	08
OR			
11	a	Write the recursive <i>FFT</i> algorithm an determine the recurrence for the run time of the procedure.	08
	b	Explain with examples the two ways of representing polynomials.	08

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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU

V Semester B. E. Examinations Nov/Dec-16

Computer Science and Engineering

FUNDAMENTALS OF COMPUTER VISION (ELECTIVE)*Time: 03 Hours**Maximum Marks: 100**Instructions to candidates:*

14. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
15. Answer FIVE full questions from Part B.

PART-A

1	1.1	Define image analysis.	02
	1.2	What is Global thresholding?	02
	1.3	Define computer vision.	02
	1.4	Why is filtering required in image processing?	02
	1.5	Give 2D Fourier transformation pair.	02
	1.6	Watershed method of thresholding associates a unique region with each _____, which can lead to _____.	02
	1.7	_____ and _____ approaches are used for Image enhancement.	01
	1.8	List the photo organization packages for face detection.	02
	1.9	What is Bag of words?	02
	1.10	List any four applications of computer vision.	02
	1.11	What is agglomerative clustering?	01

PART-B

2	a	How is image processing linked with computer vision? In continuum with this, write and explain in 3 types of computerized processing.	08
	b	Discuss at least four points, why mass storage capability is required in image processing applications.	08
OR			
3	a	Consider the image segment shown below. Let $V = \{1, 2\}$ and compute the lengths of the shortest 4-, 8- & m - path between p & q . If no path, then explain why and also resolve any ambiguity.	
		$ \begin{array}{cccc} & & (q) & \\ 3 & 1 & 2 & 1 \\ 2 & 2 & 0 & 2 \\ 1 & 2 & 1 & 1 \\ 1 & 0 & 1 & 2 \\ & (p) & & \end{array} $	
	b	With the help of diagram, explain the basic concept of sampling and quantization in detail.	08
			08

4	a	Give the equations and write how Sobel operator is used to derive steerable filter and also discuss about steering the filter.	08
	b	Give the equation and explain Laplacian of Gaussian.	08
OR			
5	a	Write the table and list the properties of Fourier transform.	10
	b	What are separable filters? Explain.	06
6	a	With the necessary equations define multilevel thresholding, global, local and adaptive thresholding.	10
	b	Write the algorithm for Thresholding using heuristic approach based on virtual inspection of the histogram.	06
OR			
7	a	Illustrate with relevant equations the role of illumination and reflection in image thresholding.	10
	b	“Applying the thresholding on an image is less effective than subdividing the image and then thresholding”, why? Justify.	06
8	a	With an example explain parametric and non-parametric density function.	06
	b	Using Gray level and texture similarity features derive a probabilistic merging algorithm.	10
OR			
9	a	With an example, explain divisive and agglomerative clustering.	10
	b	Explain meanshift filter with necessary equations.	06
10	a	Write the different methods or approaches of face recognition.	08
	b	Explain the following: i) Object detection; ii) Eigen faces.	04 04
OR			
11	a	Write and explain active appearance and 3D shape model.	08
	b	What is geometric alignment? How is this useful in face recognition?	08

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-16
Computer Science and Engineering
MULTIMEDIA COMPUTING (ELECTIVE)

*Time: 03 Hours**Maximum Marks: 100***Instructions to candidates:**

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B.

PART-A

1	1.1	What is meant by hypermedia?	01
	1.2	What is hypertext?	01
	1.3	Define dithering.	01
	1.4	List the hardware oriented color models.	02
	1.5	Write the expression to find the number of bits to store a digital image.	02
	1.6	Calculate space required to store 10min of CD-quality audio.	02
	1.7	What is the basic concept used in defining an information theoretic approach to data compression?	02
	1.8	What are the different types of pictures frames in MPEG?	02
	1.9	Differentiate between MPEG4 and MPEG7.	02
	1.10	What are the different layers in MPEG?	02
	1.11	What is RTSP?	01
	1.12	List the general bandwidth/bit rate requirement for multimedia networks.	02

PART-B

2	a	List and explain the basic tools that are required for the multimedia software.	08
	b	How is digitized image represented? Explain the various image formats available to represent image.	08
OR			
3	a	Give the definition of multimedia and multimedia system. Mention applications of multimedia.	08
	b	Distinguish between graphics image and pixel image.	08
4	a	Explain the YUV and YIQ color model.	08
	b	Explain the different types of video signals.	08
OR			

5	a	State NyQuist sampling theorem. Give the standard sampling rate for <i>CD</i> -Quality audio and telephone.	04
	b	Assuming a bandwidth of a speech signal is from 50Hz to 10kHz. Derive the bit rate that is generated by the digitization procedure assuming that NyQuist sampling rate is used with 12bits per sample for speech signal.	05
	c	What is <i>MIDI</i> ? What are the components of <i>MIDI</i> ? Explain the importance of <i>MIDI</i> .	07
6	a	The letters <i>A, B, C, D, E</i> are to be encoded and relative probability of occurrence are as follows: $P(A) = 0.16, P(B) = 0.51, P(C) = 0.09, P(D) = 0.13, P(E) = 0.11$. Apply the Huffman encoding process. Give the codes used for five characters.	08
	b	Explain run length coding with example.	08
OR			
7	a	Discuss about wavelet based coding algorithm.	08
	b	Discuss <i>DCT</i> transform coding technique.	08
8	a	Explain briefly all types of video frames associated with video compression in <i>MPEG</i> .	08
	b	Describe the image preparation step in <i>JPEG</i> compression standard.	08
OR			
9	a	Mention the key differences between <i>H.261</i> and <i>H.263</i> coding algorithm.	05
	b	Explain the <i>H.261</i> video encoder principles.	07
	c	Make a comparison of <i>JPEG</i> and <i>JPEG2000</i> standard.	04
10	a	Which QoS parameters are associated with multimedia data transmission? Explain.	08
	b	Explain the principle and application of <i>RSVP</i> .	08
OR			
11	a	Name the protocol used for communication between client and stored media server. Explain the working of stored media server.	08
	b	Describe the various broadcast schemes for video-on-demand.	08

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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU

V Semester B. E. Examinations Nov/Dec-16

Computer Science and Engineering

COMPUTER NETWORKS - I

Time: 03 Hours

Maximum Marks: 100

Instructions to candidates:

16. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
17. Answer FIVE full questions from Part B.

PART-A

1	1.1	What is the value of SNR and SNR_{dB} for a wireless channel?	02
	1.2	For a channel with a $1 - MHz$ b/w having SNR 63, what is the appropriate bit rate and signal level?	02
	1.3	What is the bandwidth of AMI er coding scheme.	01
	1.4	What is the restriction on sampling rate by Nyquist theorem?	02
	1.5	List different modes of propagating unguided signals.	02
	1.6	Name the applications of omni-directional antennas.	01
	1.7	If generator $g(x) = 1$ weather will it catch single bit error and justify.	02
	1.8	What should be the size of sender and receiver window in selective repeat $eARQ$ protocol.	02
	1.9	List different modes of communication in $HDLC$.	02
	1.10	Write the frame format of 802.3 MAC frame.	02
	1.11	Convert the following digital data to digital signal using Differential Manchester er coding scheme: 010011.	02

PART-B

2	a	For n devices in a network, what is the number of cable links required for Mesh, Star, Ring and Bus topology?	04
	b	The power of a signal is $10mW$ and power of noise is $1\mu W$; what are the values of SNR and SNR_{dB} ?	06
	c	Enumerate the concept of bandwidth-delay product by considering case 1 with b/w $1bps$ and delay $5secs$ and case 2 with b/w $4bps$ and delay $5secs$.	06
OR			
3	a	Define the term data communications and discuss different characteristics of data communications.	06
	b	If the signal at the beginning of a cable with $-0.3dB/km$ has a power of $2mW$, what is the power of the signal at $5km$?	06
	c	State Nyquist bitrate and Sharnon capacity.	04
4	a	Illustrate different transition states in $MLT - 3$ scheme.	06
	b	What is spread spectrum and explain working principle of different techniques of spread spectrum.	06

	c	Enumerate different stages in Quantization of a sampled signal by taking an example.	04
		OR	
5	a	Convert the following digital data to digital signal using 2BIQ encoding scheme (assume positive original level) 00 11 01 10 01.	06
	b	Briefly discuss advantages and disadvantages of fiber optic cables.	06
	c	Explain different components of Delta modulator and Demodulator.	04
6	a	Find the status of following generators related to burst errors of different lengths: i) $x^6 + 1$ ii) $x^{18} + x^7 + x + 1$ iii) $x^{32} + x^{23} + x^7 + 1$.	06
	b	Generate the sending site code word for the following information of 1100 by considering generator polynomial as $x^3 + x + 1$.	04
	c	Discuss the relationship of layers and address in TCP/IP.	06
		OR	
7	a	Give the comparison of connection oriented and connection less services.	04
	b	Justify the statement "two dimensional parity check can detect up to three errors occurring anywhere in table".	06
	c	Write the sender and receiver site algorithm for internet checksum.	06
8	a	Illustrate the concept of bitstuffing and unstuffing.	04
	b	Write the sender site Go-Back-N algorithm by considering all the cases.	06
	c	Explain different types of HDLC frames.	06
		OR	
9	a	Justify the statement "In Go-Back-N ARQ size of send window must be less than 2^m , the size of receive window is always 1".	06
	b	Explain different transition phases in point to point protocol.	06
	c	Illustrate exchange of HDLC frames with piggy backing with errors.	04
10	a	Explain the behavior of three persistence methods in CSMA.	06
	b	Give the comparison of different standard Ethernet implementations.	06
	c	Illustrate any two controlled access methods for accessing medium.	04
		OR	
11	a	Enumerate the working of CSMA/CA with the help of flow diagram.	06
	b	What is Hiderstation problem? Discuss the solution for the same.	06
	c	Explain the working principle of point coordination function(PCF) with the help of an example	04

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R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU

V Semester B. E. Examinations Nov/Dec-16

Computer Science and Engineering

MICROPROCESSOR AND MICROCONTROLLER**Time: 03 Hours****Maximum Marks: 100****Instructions to candidates:**

18. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
19. Answer FIVE full questions from Part B.

PART-A

1	1.1	What is the function of <i>TRAP</i> flag of 8086 microprocessor?	01
	1.2	Give the function of following assembler directives: a) <i>DUP</i> b) <i>EQU</i> .	02
	1.3	Illustrate the difference between <i>Jz</i> and <i>Jnz</i> instruction.	02
	1.4	If stack segment contains 3245H and stack pointer register contains 3000H, what is the 20 bit physical address generated by 8086 microprocessor?	02
	1.5	Write the control word format of 8255 in <i>BSR</i> mode.	02
	1.6	Define vectored maskable interrupt.	02
	1.7	Illustrate the difference between <i>NOT</i> and <i>NEG</i> instruction in 8086.	02
	1.8	Mention the status of port pins of 8051 microcontroller on <i>RESET</i> .	01
	1.9	What is the effect of executing the following instruction in 8051 microcontroller:? a) <i>MOV A, @R1</i> b) <i>MOV TH0, #35H</i> .	02
	1.10	Illustrate the function of A0 & A1 pins in 8255?	02
	1.11	Assuming <i>XTAL</i> = 11.0592MHz, write a program to generate a square wave of 50Hz frequency on <i>pin P2.3</i>	02

PART-B

2	a	Discuss flag register of 8086 with examples.	08
	b	With a neat diagram explain the minimum mode operation of 8086.	08
OR			
3	a	Explain internal architecture of 8086 microprocessor with a neat diagram.	08
	b	Draw the 8086 read and write bus cycle and discuss the flow of signals.	08

4	a	Explain the following instructions with suitable examples: i) <i>ADC</i> ii) <i>Div</i> iii) <i>JMP</i> iv) <i>INT 3</i> .	08
	b	Write an assembly level program to check whether the entered number is even number or odd number. OR	08
5	a	Explain the following instructions with example: i) <i>LODS</i> ii) <i>CMP</i> iii) <i>MOVSB</i> iv) <i>INC</i>	08
	b	Write an assembly level program for division of 16 bit number by 8 bit number.	08
6	a	Draw the structure of interrupt vector table of 8086 and explain interrupt response sequence of 8086.	08
	b	Interface a 8-digit 7 segment <i>LED</i> display using 8255 to 8086 microprocessor system and write an assembly language routine to display message on the display. OR	08
7	a	Write the control word of 8255 and explain (Both <i>I/O</i> and bit set reset mode).	10
	b	Explain with a neat diagram the interfacing of seven segment display to 8086 using 8255 in detail.	06
8	a	With an example, explain any five addressing modes of 8051.	10
	b	Write an 8051 <i>C</i> program to toggle bit <i>D0</i> of the port <i>P1(P1.0)</i> 50,000 times. OR	06
9	a	With a neat diagram explain the memory system of 8051 microcontroller (include details of internal and external memory).	10
	b	Write an 8051 assembly language program to generate full rectified sine waveform using <i>DAC</i> .	06
10	a	Interface 8051 to stepper motor and write an assembly language program to rotate the motor first +4 steps and then –6 steps.	08
	b	Explain asynchronous serial communication with 8051, draw the interfacing circuit to connect to <i>PC</i> serial port. OR	08
11	a	Interface 4 × 4 keypad to 8051 using suitable ports and write a procedure which, when called, wait for the key press and return the code of the key press.	08
	b	Explain with interfacing details, how to control the <i>AC/DC</i> high power devices using 8051 microcontroller.	08

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-16
Computer Science and Engineering
DATABASE MANAGEMENT SYSTEMS

*Time: 03 Hours**Maximum Marks: 100**Instructions to candidates:*

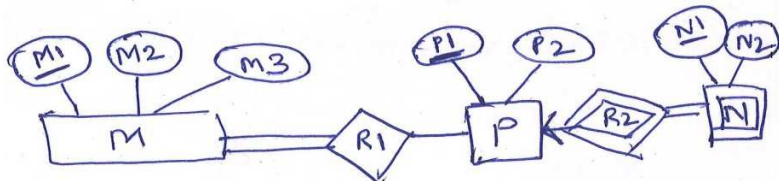
20. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
21. Answer FIVE full questions from Part B.

PART-A

1	1.1	What are the requirements for relation to be called union compatible?	02																
	1.2	Add one word in the <i>SQL</i> expression to list “customer_name” from a <i>CUSTOMER</i> table having atleast three characters and having the 2 nd and 3 rd characters as <i>I</i> and <i>N</i> respectively. <i>select customer_name from CUTOMER where customer_name like_____.</i>	01																
	1.3	The following table has two attributes <i>A</i> and <i>C</i> where <i>A</i> is the primary key and <i>C</i> is the foreign key referencing <i>A</i> with on-delete cascade. <table border="1"><thead><tr><th><i>A</i></th><th><i>C</i></th></tr></thead><tbody><tr><td>2</td><td>4</td></tr><tr><td>3</td><td>4</td></tr><tr><td>4</td><td>3</td></tr><tr><td>5</td><td>2</td></tr><tr><td>7</td><td>2</td></tr><tr><td>9</td><td>5</td></tr><tr><td>6</td><td>4</td></tr></tbody></table>	<i>A</i>	<i>C</i>	2	4	3	4	4	3	5	2	7	2	9	5	6	4	
	<i>A</i>	<i>C</i>																	
	2	4																	
	3	4																	
	4	3																	
	5	2																	
	7	2																	
	9	5																	
6	4																		
	Find and write the set of all tuples that must be additionally deleted to preserve referential integrity when the tuple (2,4) is deleted.	02																	
1.4	The employee information in a company is stored in the relation. What does the following query return? <i>EMPLOYEE(name,sex,salary,deptName)</i> Consider the following <i>SQL</i> query: <i>Select deptName from EMPLOYEE where sex = ‘M’ groupby deptName having avg(salary) > (select avg(salary) from EMPLOYEE).</i>	02																	
1.5	Identify the need for mapping between Schema levels.	02																	
1.6	List any two user friendly interfaces used in data base packages.	02																	
1.7	Consider the relation <i>r(x,y,z,w)</i> and a set { <i>y → w,xy → z</i> } where the symbol <i>y → w</i> means <i>y → w</i> and <i>w → y</i> simultaneously. What are the candidate keys of <i>R</i> ? What is the highest normal form of relation?	02																	
1.8	Consider a relation with schema <i>R(A,B,C,D)</i> and <i>FDs</i> <i>A → C</i> ; <i>BC → D</i> , <i>D → C</i> and <i>AD → B</i> . Find the closures for subsets <i>AC</i> and <i>AD</i> respectively.	02																	
1.9	The total number of attributes ‘ <i>n</i> ’ of a relation schema <i>R</i> is called as _____ of a relation.	01																	
1.10	Identify the need for <i>DBMS</i> to ‘maintain’ the database systems.	01																	

1.11	_____ are the systems with large databases and hundreds of concurrent users executing database transactions.	01
1.12	_____ and _____ are the two main strategies that can be employed when flushing a modified buffer back to disk.	02

PART-B

2	<p>a Discuss the main characteristics of the database approach and how it differs from traditional file systems.</p> <p>b Consider a database company Artbase that builds a product for art galleries. Galleries keep information about artists, their names (which are unique), birthplaces, age and style of art. For each piece of artwork, the artist, the year it was made, its unique title, its type of art and its price must be stored. Pieces of artwork are also classified into various kinds, for example, portraits, still lifes, works by Picasso or works of the 19th century; A given piece may also belong to more than one group. Each group is identified by a name that describes the group. Finally, galleries keep information about customers. For each customer, galleries keep that person's unique name, address, total amount of dollars spent in the gallery, and the artists and groups of art that the customer tends to like. Draw the <i>ER</i> diagram for the database.</p>	08
	OR	
3	<p>a Consider the following <i>ER</i> diagram.</p>  <p>What is the minimum number of tables needed to represent <i>M, N, R, P, R₁, R₂</i>. Describe the schema of each table.</p> <p>b Categorize the end users of the database system and also discuss their activities.</p> <p>c Define the following terms with an example</p> <ol style="list-style-type: none"> Candidate key; Primary key; Foreign key; Super key. 	04 08 04
4	<p>a Use complete set of Relational Algebra Operations to derive division operation. Discuss with an example.</p> <p>b For the database schema given below: <i>STUDENT</i>(Name, Studentnumber, Class, Major) <i>COURSE</i>(Coursename, Coursenumber, Credit_hrs, Department) <i>SECTION</i>(SecId, Coursenumber, Semester, Year, Instructor) <i>GRADEREPORT</i>(Studentnumber, SecId, Grade) <i>PREREQUISITE</i>(Coursenumber, prerequisitenumber).</p>	08

		Use <i>SQL</i> to	
		i) Retrieve the names of all senior students (above class = 7) majoring in 'CS'.	02
		ii) Retrieve the names of all courses taught by professor King in 1998 and 1999.	03
		iii) For each section taught by Professor King, retrieve the course number, credit hours, course name, semester, year and the number of students who took the section.	03
		OR	
5	a	Discuss the following relational algebra operators. Illustrate them with an example for each. <i>EQUIJOIN, NATURAL JOIN, UNION, SET DIFFERENCE.</i>	08
	b	Consider the following relational schema. <i>EMP(eid : integer, ename: string, age: integer, salary: real)</i> <i>WORKS(eid : integer, did : integer, Pcttime: integer)</i> <i>DEPT(did: integer , dname: string, budget : real, managerid : integer).</i> Use <i>SQL</i> statements for the following: i) Give an example of a foreign key constraint that involves the Dept relation. What are the options for enforcing this constraint when the user attempts to delete a Dept tuple? ii) Write <i>SQL</i> statements required to create <i>EMP</i> and <i>DEPT</i> , including appropriate versions of all Primary and Foreign key integrity constraints.	4+4
6	a	Consider the following relation: <i>STUDENT(Student_id, First_name, Last_name, Major_id, Degree_id, Major_name, Degree_name, Address)</i> Student_id determines all other attributes, Major_id determines Major_name and Degree_id determines Degree_name. Is the student relation in <i>BCNF</i> ? If it is so, explain why, if it is not, convert it to <i>BCNF</i> .	06
	b	Describe the need for Normalization? Explain the first and second <i>NF</i> .	08
	c	Discuss the problem of spurious tuples.	02
		OR	
7	a	Explain informal design guidelines for relation schema.	08
	b	A relation <i>R</i> has four attributes <i>A, B, C, D</i> . For each of the following sets of <i>FD</i> , identify the candidate key and the highest <i>NF</i> : i) $C \rightarrow D, C \rightarrow A, B \rightarrow C$ ii) $B \rightarrow C, D \rightarrow A$.	08
8	a	Explain the properties of a transaction with state transition diagram.	08
	b	Why is concurrency control needed? Explain major problems with suitable examples.	08
		OR	
9	a	Demonstrate two-phase locking techniques used for concurrency control.	08
	b	Discuss the <i>ACID</i> property of transactional database.	08

10	a	Explain all the phases involved in <i>ARIES</i> algorithm with an example.	10
	b	Explain the terms: Steal and no-steal approach in Standard <i>DBMS</i> recovery schemes.	06
OR			
11	a	With an example, explain the concept of mandatory access control and role based access control for multi-level security.	10
	b	Describe the shadow paging recovery technique.	06