USN

PROBABILITY, STATISTICS AND QUEUING (ELECTIVE)

Time: 03 Hours   *Maximum Marks: 100*
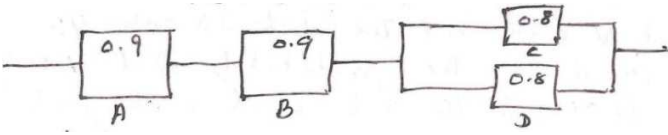*Instructions to candidates:*
   1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
   2. Answer FIVE full questions from Part B.
   3. Use of statistical tables permitted.

PART-A

1	1.1	Find K such that $P(K < t < -1.761) = 0.045$ for a random sample of size 15 selected from a normal distribution.	02
	1.2	If a random variable X has the F $M(t) = \frac{3}{3-t}$, obtain the standard deviation of X.	02
	1.3	If the characteristic function of a random variable X is $\emptyset_X(w)$ and if $Y = aX + b$, then show that $\emptyset_Y(w) = e^{ibw}\emptyset_x(aw)$.	01
	1.4	Obtain an average waiting time in the system and an average waiting time in the queue for $M/M/1:\infty/FIFO$ queuing system, using Little's law.	02
	1.5	The claim that variance of normal population 21.3 is rejected, if variance of a random sample of size 15 exceeds 39.74. What is the probability that the claim is rejected?	01
	1.6	State and prove Markov's inequality.	02
	1.7	Find $coV(3X + 2Y, 2X + 3Y)$, given $Var(X) = 5$, $Var(Y) = 3$ and $coV(X,Y) = -3$.	02
	1.8	State central limit theorem.	01
	1.9	Define an absorbing state of the Markov chain. What do you mean by an absorbing Markov chain?	01
	1.10	Show that the probability of more than n jobs in $M/M/1:\infty/FIFO$ system is ρ^{n+1}.	02
	1.11	If $P(A) = 0.75$ and $P(B) = 0.8$ find $P(A \cap \bar{B}) \cup P(\bar{A} \cap B)$.	02
	1.12	When do you say that a counting process posses stationary increments and independent increments.	02

PART-B

2	a	Suppose that in the maintenance of large medical insurance, probability of error in processing is 0.001, probability of error in filing is 0.0009, probability of error in retrieving is 0.001, probability of error in processing as well as filing is 0.0003, probability of error in filing and retrieving is 0.0003 and probability of error in processing, filing and retrieving is 0.0001. i) What is the probability of making at least one error? ii) What is the probability of making at most two errors? And iii) What is the probability of making no error?	06

	b	An electric system consists of four components as illustrated in the following figure: The system works if components A and B work and either of the components C or D work. The probability of working of each component is also shown in the figure. Find the probability that
		  i) The entire system works.
		  ii) The component C does not work, given that the entire system works.
		Assume that four components work independently.
			06

	c	The time to check out and process information at an office website can be modeled as a random variable with mean 63 seconds and variance 81 seconds. If sample mean $\bar{X}$ will be based on a random sample of size 36 times what can be asserted about the probability that $\bar{X} \geq 66.75$ seconds.	04

OR

3	a	If $f(x,y) = \begin{cases} \frac{12}{5}x(2 - x - y), & 0 < x < 1, 0 < y < 1 \\ 0, & otherwise \end{cases}$
		is a joint PDF, then find:
		  i) $g(x/y)$
		  ii) $h(y/x)$
		  iii) $E(X/Y = \frac{1}{2})$ and
		  iv) $E(Y/X = \frac{1}{4})$
			10

	b	A process for making bearings is under control if diameters of the bearings have a mean $0.5\ cm$. What can you say about the process if a sample of 10 of these bearings has a mean diameter of $0.506\ cm$ and standard deviation of $0.04\ cm$?	03

	c	Two firms V and W consider bidding on a road building job, which may be awarded depending on the amounts of bids. Firm V submits a bid and the probability is $\frac{3}{4}$ that it will get the job provided W does not bid. The probability is $\frac{3}{4}$ that W will bid and if it does, the probability that V will get the job is only $\frac{1}{3}$.
		  i) What is the probability that V will get the job?
		  ii) If V gets the job, what is the probability that W did not bid?
			03

4	a	To test a paint manufacturer's claim that the average drying time of his fast drying paint is $\mu = 20$ minutes. A random sample of 36 boards painted with his paint and his claim is rejected if $\bar{X} > 20.5$
		  i) Find the probability of type1 error
		  ii) Find the probability of type 2 error when $\mu = 21$ minutes
		(Assume $\sigma = 2.4\ minutes$)
			08

	b	A research worker wants to determine the average time it takes a mechanic to rotate the tires of a car, and she wants to be able to assert with 95% confidence that the mean of her sample is off by at most 0.50 minute. If she can presume from past experience that $\sigma = 1.6$ minutes, how large a sample will have to take?	04

	c	In six determinations of the melting point of tin, a chemist obtained a mean of 232.26 degrees Celsius with a standard deviation of 0.14°C. If he uses this mean to estimate the actual melting point of tin, what can the chemist assert with 98% confidence about the maximum error? **OR**	04
5	a	The mean breaking strength of the cables supplied by a manufacturer is 1800 with a standard deviation of 100. By a new technique in the manufacturing process, it is claimed that the breaking strength of the cable has increased. To test this claim, a sample of 50 cables is tested and it is found that the mean breaking strength is 1850. Can we support the claim at $\propto = 0.01$	06

	b	The following random samples are measurements of the heat-producing capacity (in millions of calories per ton) of specimens of coal from two mines.
		       Mine 1: 8,260 8,130 8,350 8,070 8,340
		       Mine 2: 7,950 7,890 7,900 8,140 7,920 7,840
		
		Use the 0.01 level of significance to test whether the difference between the means of these two samples is significant.
			10

6	a	Derive the Chebyshev's inequality using Maricov's inequality.	03

	b	Suppose an interactive computer system is proposed for which it is estimated that the mean response time $E(T)$ is 0.5 seconds.
		    i) Estimate the probability that the response time T will be 2 seconds or more.
		    ii) If the standard deviation of the response time is 0.1 seconds, estimate the probability that the response time will be between 0.25 and 0.75 seconds.
			04

	c	Given that the switch board of the consultant office receives on an average of 1.6 calls per minute, find the probabilities that
		    i) In a two minutes interval, there will be at least 2 calls.
		    ii) In a four minutes interval, there will be at most 2 calls.
			06

	d	Find the cumulative distribution function for an exponential distribution. **OR**	03
7	a	Find the moment generating function of the Poisson variate and hence find standard deviation of the same.	07
	b	State and prove Jensen's inequality. Find Jensen's inequality if $f(x) = x^2$	05
	c	State and prove Chernoff bounds.	04

8	a	Students arrive at the university computer centre in a Poisson manner at an average of 10 per hour. Each student spends an average of 20 minutes at the terminal, and time can be assumed to be exponentially distributed. The centre currently has 5 terminals. Find:
		    i) Average number of jobs in the system.
		    ii) Probability of n jobs in the system.
		    iii) Mean response time.
			08

	b	On a network gateway, measurements show that the packets arrive at a mean rate of 125 packets per second (pps) and the gateway takes about 2 miliseconds to forward them. Let us assume that the gateway has only two buffers. Find:
		  i) The mean number of jobs in the queue.
		  ii) The mean waiting time in the queue.
		  iii) Variance of number of jobs in the system.
		 OR
			08

9	a	For $M/M/1: \infty/FIFO$ model, derive the formula for
		  i) Average number of jobs in the system.
		  ii) Average number of jobs in the queue.
		  iii) Probability of more than K jobs in the system.
		  iv) Probability that the waiting time of the customer in the system exceeds t.
			06

	b	There are three typists in an office. Each type typist can type an average of 6 letters per hour. If letters arrive for being typed at the rate of 15 letters per hour.
		  i) What fraction of the time all the typists will be busy?
		  ii) What is the average number of letters waiting to be typed?
		  iii) What is the probability that a letter will take longer than 20 minutes waiting to be typed and being typed?
			10

10	a	Discuss about the classification of states of a Markov chain.	04

	b	In a Cascade binary communication channel, the symbols 0 and 1 are transmitted in successive stages. In any stage, the probability of transmitting 1 is received as 1 is 0.75 and the probability of transmitting 0 is received as 0 is 0.5. If the probability of transmitting a 1 in the initial stage is $\frac{5}{8}$, find the probability of receiving
		  i) a zero, and
		  ii) a one in the fourth stage.
			06

	c	Find the stationary probability vector for the Markov chain represented by $\begin{pmatrix} 0 & 0 & 1 \\ \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ 0 & 1 & 0 \end{pmatrix}$ **OR**	06
11	a	Find the reverse Markov chain for the markov chain represented by $\begin{pmatrix} \frac{2}{3} & 0 & \frac{1}{3} \\ 0 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} & 0 \end{pmatrix}$	08

	b	A gambler's luck follows a pattern. If he wins the game, the probability of winning the next game is 0.6. However if he loses a game, the probability of his losing the next game is 0.7. There is an even chance that the gambler wins the first game. What is the probability that he wins
		  i) The second game
		  ii) The third game, and
		  iii) In the long run?
			08

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-17
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	Mention the two orthogonal views of software construction.	01
	1.2	How are objects identified in an object-oriented system?	01
	1.3	Define an axiom. Mention the two axioms specified in object oriented design.	02
	1.4	Differentiate between static and dynamic binding.	02
	1.5	List any two differences between verification and validation.	02
	1.6	List any four Booch diagrams.	01
	1.7	Define Qualifier in the *UML*, with an example.	01
	1.8	Mention the two-three rule for identifying actors.	01
	1.9	Differentiate between abstract use cases and concrete use cases with suitable examples.	02
	1.10	Draw the binary association diagram between a bank account and a person.	02
	1.11	_____ patterns are static and passive.	01
	1.12	Identify two attributes and two operations for the class "car".	02
	1.13	Write the 80 − 20 rule followed for documentation.	01
	1.14	Define antipattern.	01

PART-B

2	a	Describe water fall model for *SDLC* with a neat diagram. Mention its advantages and disadvantages.	06
	b	Describe the main features of an object oriented system.	06
	c	Explain the terms object persistence and meta classes.	04

OR

3	a	Define the following with suitable examples for each:
		   i) Object
		   ii) Class
		   iii) Class diagram
		   iv) Attributes
		   v) Operations.
			05

	b	List any five advantages of Object oriented *SDLC* over traditional *SDLC*.	05
	c	Explain the importance of prototyping with its categories.	06

4	a	Differentiate between aggregation, association and composition. Give their respective *UML* notations with examples for each.	06
	b	Explain the three layered approach followed in software development.	06
	c	Draw the use case diagram for a Library system.	04

OR

5	a	How are *UML* interaction diagrams represented? Explain each one with an example of caller and receiver in a telephonic communication.	08
	b	Draw the *UML* activity diagram for processing mortgage results.	04
	c	Write a short note on Model Management.	04

6	a	Justify as to why, analysis is a creative activity. Explain the three most common sources of requirement difficulties.	06
	b	Explain Noun phase approach for choosing classes in detail with respect to ViaNet Bank *ATM* system.	06
	c	List the guidelines to be followed for naming classes.	04

OR

7	a	List and explain the guidelines to be followed to develop an effective documentation.	06
	b	Describe a common class pattern approach for identifying classes from the given problem definition.	06
	c	With a neat diagram, list the guidelines for identifying super-sub relationship in the application.	04

8	a	Explain the significance of public, private and protected protocols with respect to designing classes.	08
	b	List all the *UML* notations used to represent attributes and operations in designing classes with examples for each.	04
	c	Draw the complete *UML* class diagram for the ViaNet bank *ATM* system.	04

OR

9	a	Describe the six corollaries designed from the two design axioms.	12
	b	Explain with a neat diagram, the activities involved in object oriented design process.	04

10	a	Explain how patterns help to meet the objectives of software engineering.	06
	b	Describe the whole part design pattern with an example.	10

OR

11	a	Explain how master slave pattern supports fault tolerance, parallel computation and computational accuracy.	10
	b	What is a pattern? Explain with an example. Also explain the three main categories of patterns.	06

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R. V. COLLEGE OF ENGINEERING
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V Semester B. E. Examinations Nov/Dec-17
Computer Science and Engineering
INTRODUCTION TO MACHINE LEARNING (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	How to avoid over-fitting in Regression?	02
	1.2	Find the expected value and variance of discrete random variable X, if the probability distribution is as follows:	

X	8	12	16	20	24
$P(X = x)$	$\frac{1}{8}$	$\frac{1}{6}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{12}$

			02
	1.3	Write the three different activation functions for units in ANN.	02
	1.4	How to generalize Bayesian decision theory?	02
	1.5	Define Parizen window.	02
	1.6	Compare and contrast classification and clustering.	02
	1.7	List any four applications of clustering.	02
	1.8	Differentiate between agglomerative and divisive clustering.	02
	1.9	List any four algorithms used for spam detection.	02
	1.10	Define Recommender system.	02

PART-B

2	a	List any four properties of normal distribution.	04
	b	Describe Bayes theory with example.	06
	c	A continuous random variable X has a pdf $f(x) = Kx^2e^{-x}, x \geq 0$. Find K, mean and variance.	06
		OR	
3	a	Write note on Curse of dimensionality.	06
	b	Discuss entropy and mutual information principles in Information Theory.	06
	c	Let X and Y be two random variables such that $var[X] = 4$, $var[Y] = 3$, $cov[X, Y] = -2$. Compute the following covariance $cov[2X + Y, X + 3Y]$.	04
4	a	State and derive an equation for minimum risk classifier. Further use it to solve two category case.	08
	b	Summarize bivariate normal density.	08
		OR	

5	a	Explain Back propagation algorithm.	08
	b	Illustrate two layer Feed-Forward neural network with the example and neat diagram.	08
6	a	Explain linear discriminant function for two category case.	08
	b	Bring out merits and demerits of parametric and non-parametric approaches for the classification purpose.	08

OR

7	a	Explain *KN* Nearest neighbor algorithm for classification with example.	10
	b	Write a note on Fuzzy classification.	06
8	a	Describe *K*-means clustering algorithm.	08
	b	Write a note on Online Clustering algorithm.	08

OR

9	a	Develop an algorithm for agglomerative hierarchical clustering.	08
	b	Describe with an example single linkage and complete linkage methods.	08
10	a	Estimate the rating of the movie 1 by user 5. (Consider two neighbors and use item collaborative filtering).	

Users

	U_1	U_2	U_3	U_4	U_5	U_6	U_7	U_8	U_9	U_{10}	U_{11}	U_{12}
I_1	1		3			5			5		4	
I_2			5	4			4			2	1	3
I_3	2	4		1	2		3		4	3	5	
I_4		2	4		5			4			2	
I_5			4	3	4	2					2	5
I_6	1		3		3			2			4	

Items(Movies)

▨ Rating from 1 to 5 ☐ Unknown rating

			10
	b	Write a note on Click probabilities.	06

OR

11		Summarize document clustering with proper example.	16

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V Semester B. E. Examinations Nov/Dec-17
Computer Science and Engineering
ARTIFICIAL INTELLIGENCE (ELECTIVE)
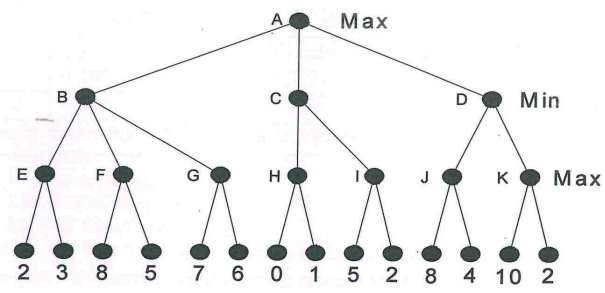
Time: 03 Hours   *Maximum Marks: 100*
Instructions to candidates:
6. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
7. Answer FIVE full questions from Part B.
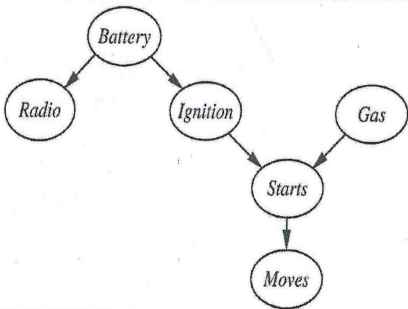
PART-A

1	1.1	Write the predicate calculus expressions for the following statements: a) Men who are intelligent have knowledge. b) If it does not rain tomorrow, Jack will go for trekking.	02
	1.2	Define admissibility and informedness properties of heuristic with an example each.	02
	1.3	Perform minimax on following given tree: Figure 1	01
	1.4	Mention the methods used to determine the conditional independence in Bayesian network.	02
	1.5	Illustrate the modos ponens inferencing rule in predicate calculus.	01
	1.6	Given that the disease meningitis causes a patient to stiff neck 60% of time, the prior probability that patient has stiff neck is 1/40,000 and prior probability that any patient has a stiff neck is 1/10. Calculate the probability that a patient has meningitis given stiff neck.	02
	1.7	Differentiate between forward chaining and backward chaining.	02
	1.8	Given the Bayesian network given below: Calculate $P(l, d, a, j, m)$ Figure 2	02

	1.9	Differentiate algorithm A and algorithm A^*	02
	1.10	Differentiate informed and uninformed search techniques with an example.	02
	1.11	Construct a Bayesian network for the following car's electrical problem statement. • The fire alarm usually goes off when there's a fire • When the alarm rings, everyone usually exits together • Most of the time there's smoke when there's a fire • Someone sometimes pulls the fire alarm "as a joke" • The fire trucks usually come when the alarm goes off • Sometimes everyone exits together for a picnic.	02

PART-B

2	a	Discuss the following approaches to *AI* definition: i) Turing test approach ii) Rational agent approach.	08
	b	List and explain the *AI* characteristics. Illustrate with an example of tic-tac-toe program.	08
		OR	
3	a	Define Artificial Intelligence (*AI*) and discuss the different approaches in defining *AI*.	08
	b	Discuss applications of artificial intelligence with respect to mundane task and expert task.	08
4	a	What is a production system? Explain the functionality of various components of production system with a schematic diagram.	08
	b	Discuss alpha-beta pruning of a search tree and perform alpha-beta pruning on following tree. 	08
		OR	
5	a	Explain Recursion based search and pattern directed search with an example each.	08
	b	Illustrate with the help of neat diagram Black board architecture for problem solving.	08

6	a	Consider the network for car diagnosis shown in figure below.	
		i) Extend the network with Boolean variables ICYWeather and StarterMotor.	
		ii) Give reasonable conditional probability tables for all nodes.	
		iii) How many independent values are contained in the joint probability distribution for eight Boolean nodes, assuming that no conditional independence relations are known to hold among them?	
		iv) How many independent probability values do your network tables contain?	10
	b	Explain how agents handle uncertainity in decision making.	06

OR

7	a	Given the full joint distribution calculate the following: i) P(rain) ii) P(rain V sprinkler) iii) P(rain|sprinkler) iv) P(rain|cloudy V sprinkler)	

	Sprinkler		~ Sprinkler	
	Cloudy	~Cloudy	Cloudy	~Cloudy
rain	0.108	0.012	0.072	0.008
~rain	0.016	0.064	0.144	0.576

			10
	b	Discuss the following approximate inference techniques in Bayesian network with an example each: i) Rejection sampling ii) Likelihood sampling iii) *MCMC* Sampling.	06

8	a	Explain current best hypothesis search with its algorithm.	08
	b	Discuss how explanation based learning process works.	08

OR

9	a	Differentiate parametric and non-parametric learning. Explain one example for each learning method.	10
	b	Discuss with an example top down inductive logic programming.	06

10	a	With the help of a neat diagram discuss the utility based agent architecture and its functionality.	10
	b	Discuss the ethics and risks involved in developing *AI*.	06
		OR	
11	a	Discuss the ethics and social concerns of Artificial Intelligence (*AI*).	10
	b	Differentiate weak *AI* and strong *AI* with examples.	06

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V Semester B. E. Examinations Nov/Dec-17
Computer Science and Engineering
GRAPH THEORY AND APPLICATIONS (ELECTIVE)
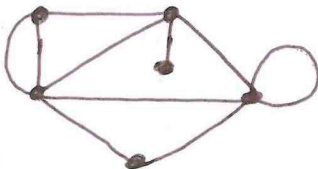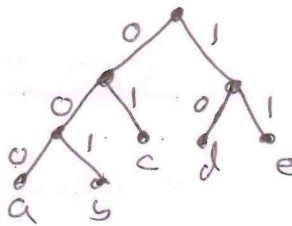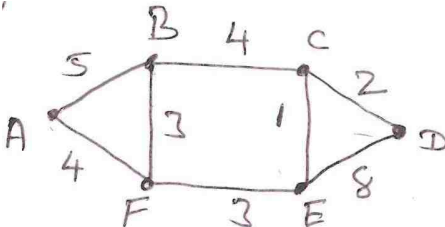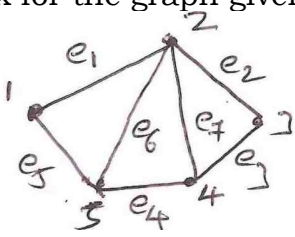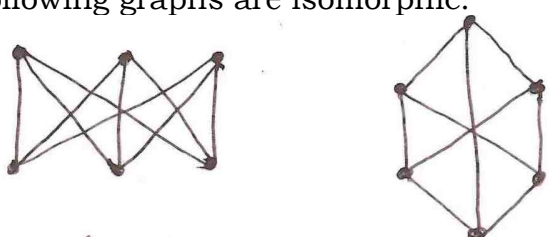
Time: 03 Hours   *Maximum Marks: 100*
Instructions to candidates:
  8. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
  9. Answer FIVE full questions from Part B.

PART-A

1	1.1	Determine the order of graph G having 10 edges with 2 vertices of degree 4 and all other vertices of degree 3.	02
	1.2	How many vertices are there in a hypercube with 4980736 edges?	02
	1.3	Verify Eluer formula for the planar graph shown below:	02
	1.4	Find the minimum number of vertices necessary for a simple connected graph with 11 edges to be planar.	02
	1.5	What is the chromatic number of the following graph?	02
	1.6	Find the number of pendant vertices in a tree having two vertices of degree 2, four vertices of degree 3 and three vertices of degree 4.	02
	1.7	Find the prefix code represented by the following labeled complete binary tree:	02
	1.8	Find the maximum possible flow between the vertices A and D in the network shown below:	02

1.9	Write the incidence matrix for the graph given below:		
			02
1.10	Define: i) Matching ii) Complete matching.		02

PART-B

2	a	For a graph with n-vertices and m-edges, if δ is the minimum and Δ is the maximum of the degrees of the vertices, show that $\delta \leq \frac{2m}{n} \leq \Delta$	05
	b	If a simple graph G of order n is isomorphic to its complement $\bar{G}$, show that n or $(n-1)$ must be a multiple of 4.	05
	c	Prove that, in a graph there is a $u-v$ trial if and only if there is a $u-v$ path.	06
		OR	
3	a	Show that the following graphs are isomorphic: 	05
	b	Prove that a simple graph with n-vertices and k-components can have at most $(n-k)(n-k+1)/2$ edges.	06
	c	Show that every simple graph must have at least two vertices of the same degree.	05
4	a	Show that in a complete graph with n-vertices, where n is an odd number≥ 3, there are $(n-1)/2$ edge-disjoint Hamiltonion cycles.	05
	b	Prove that a connected graph is a tree if and only if it is minimally connected.	06
	c	Let F be a forest with k-components. If n is the number of vertices and m is the number of edges in F, prove that $n = m + k$	05
		OR	
5	a	Prove that a graph is connected if and only if it has a spanning tree.	05
	b	Prove that a connected graph G has an Euler circuit if and only if all vertices of G are of even degree.	06
	c	Define the following: i) Rooted tree ii) Binary tree iii) Bipartite graph.	05

6	a	Show that every connected simple planar graph G contains a vertex of degree less than 6.	05
	b	If G is a graph without isolated vertices, then with usual notations show that $\propto'(G) + \beta'(G) = n(G)$	05

	c	Define the following:
		    i) Edge connectivity
		    ii) Blocks in separate graphs
		    iii) Dual of a planar graph.
			06

		OR	
7	a	Prove that two blocks in a graph share at most one vertex.	05

	b	Show that the following are equivalent for a planar graph G:
		    i) G is bipartite
		    ii) Every face of G has even length
		    iii) The dual graph G^* is Eulerian
			06

	c	Prove that every component of the symmetric difference of two matchings is a path or on even cycle.	05
8	a	If $\Delta(G)$ is the maximum of the degrees of vertices of a graph G, prove that $\psi(G) \leq \Delta(G) + 1$.	08
	b	Prove that every connected simple planar graph is 6-colorable.	08
		OR	
9	a	Find the chromatic polynomial for the cycle C_4 of length 4.	04
	b	Prove that a simple graph has a simplicial elimination ordering if and only if it is a chordal graph.	06

	c	Define the following:
		    i) Chromatic number
		    ii) Chromatic polynomial
		    iii) Power of graph.
			06

10	a	Using Prim's algorithm, find a minimal spanning tree for the weighted graph shown below. 	08
	b	Using the Dijkstra's algorithm, obtain the shortest path from vertex u to each of the other vertices in the graph shown below. 	08
		OR	
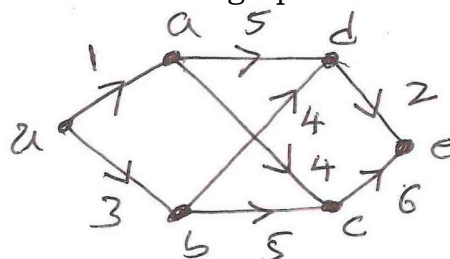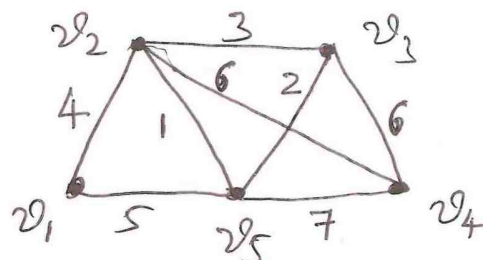
11	a	Explain Kruskal's algorithm for finding minimum spanning tree, with an example.	08
	b	Explain Ford-Fulkerson algorithm with an example.	08

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-17
Computer Science and Engineering
JAVA AND JEE (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 will this code print?
		class while
		{
		    public static void main (string args [ ])
		    {
		        int n = 10;
		        while(n > 0)
		        {
		            system. out. println("Number" + n);
		            n − −;
		        }
		    }
		}
			02

	1.2	A _____ initializes an object upon creation.	01
	1.3	_____ can be used inside any method to refer to the current object.	01
	1.4	Write the general form of a class declaration that inherits a superclass.	01
	1.5	In _____ package, Java defines several encryption classes.	01
	1.6	Write the advantage of chained exceptions in Java.	01
	1.7	Draw the importance of the main thread in Java program.	02
	1.8	Give the general from of isAlive ( ).	01
	1.9	A _____ is an object that is used as a mutex in synchronization.	01
	1.10	List any four collection interfaces.	02
	1.11	_____ JDBC driver type (s) can be used in either applet or servlet code.	01
	1.12	What programming language(s) or scripting language(s) does *JSP* support?	01
	1.13	List the two packages which contains the classes and interfaces required to build servlets.	02
	1.14	A _____ is stored on a client and contains state information.	01
	1.15	Which method of *HTTP* servlet Request is used to create a session?	01
	1.16	What is meant by native method in Java?	01

PART-B

2	a	With suitable code, discuss the uses of final keyword in inheritance.	06
	b	Discuss any six commonly used methods of thread class.	06
	c	List and explain the Java buzz words.	04
		OR	

3	a	Write a Java program that creates a class called FixedStack, which implements a fixed – length version of an integer stack.	08
	b	What is meant by package? With suitable examples explain access protection in packages.	08
4	a	What is an exception? How does Java handle exceptions? With an example program illustrate the use of finally block.	08
	b	What is the need of synchronization? Explain with an example how synchronization is implemented in Java.	08

OR

5	a	Explain the concept of Java thread model in detail.	08
	b	Write a Java program to find the factorial of a given number. Include exception handling mechanisms to handle negative numbers as input and large number as output.	08
6	a	With programming example, explain Array-list and linked-list collection classes.	10
	b	Write a program to display the current contents of a table in the database using *JDBC* connection. Assume a table.	06

OR

7	a	What is meant by transaction processing? Write a Java program to execute database transaction.	06
	b	Briefly explain the overview of *JDBC* process.	05
	c	Write a program to crate mailing list with class Address and suitable attributes. Use a linked list to store mailing addresses.	05
8	a	Write any three *JSP* tags and discuss their use in building *JS* pages.	06
	b	Develop a simple servlet program that handles the *HTTP* request and response.	06
	c	Describe the life cycle of a servlet.	04

OR

9	a	Describe how Tomcat server is configured for servlet development.	06
	b	What is the difference between Servlet and *JSP*? Explain different types of *JSP* tags with syntax.	06
	c	Briefly explain the *MVC* architecture used to develop web applications.	04
10	a	How to call a *C* language function from Java programming language? Explain with an example.	08
	b	Explain the steps involved in mapping argument types in native method declaration to native programming language.	08

OR

11	a	What are Java native *APIs*? Explain.	04
	b	What are native methods in Java and where should they be used? Explain with code snippet.	04
	c	Discuss the following Java native methods concepts: 　　i)　　Encoding signatures 　　ii)　　Handling errors.	08

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R. V. COLLEGE OF ENGINEERING
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V Semester B. E. Examinations Nov/Dec-17
Computer Science and Engineering
ADVANCED ALGORITHMS (ELECTIVE)
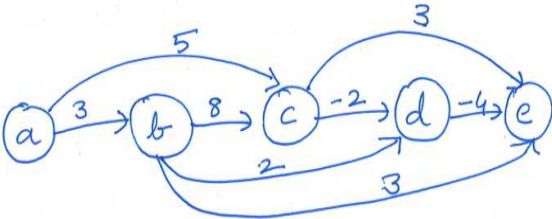
Time: 03 Hours   *Maximum Marks: 100*
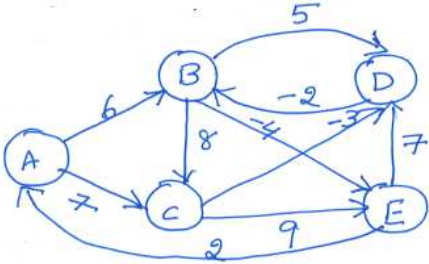*Instructions to candidates:*
    12.   Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
    13.   Answer FIVE full questions from Part B.
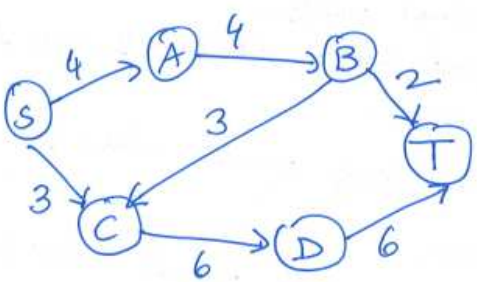
PART-A

1	1.1	Differentiate between average case analysis and amortized analysis.	02
	1.2	Using master theorem, Solve the following: $T(n) = 9T\left(\frac{n}{3}\right) + n$	01
	1.3	What is a skiplist?	01
	1.4	Mention different algorithms which are applied in Johnson algorithm. What is the complexity of Johnson Algorithm?	02
	1.5	Given $T = 31415926535$, $P = 26$ and $q = 11$. Find the number of spurious hits using Rabin Karp algorithm.	02
	1.6	Define constraints of a flow network.	02
	1.7	Find the potential of a Fibonacci heap given $t(H) = 3$ and $m(H) = 3$.	01
	1.8	Define mincut in a flow network.	02
	1.9	What are Carmichael numbers?	01
	1.10	Convert polynomial $A(x) = x^3 + 2x^2 + x + 2$ and $B(x) = 2x^3 + x^2 + x + 1$ to point value representation form and add them.	02
	1.11	Perform the operation, find (5) in the given splay tree.	02
	1.12	Find DFT for the vector (2,3).	02

PART-B

2	a	Using recursion tree method, determine a good asymptotic upper bound on the recurrence $T(n) = 3T\left(\frac{n}{4}\right) + n^2$. Use substitution method to verify the answer.	10
	b	Explain accounting method for stack operations.	06
		OR	

3	a	Define and explain various asymptotic notations with related graphs and examples.	08
	b	Using recursion tree method, find asymptotic upper bound on recurrence $T(n) = 2T\left(\frac{n}{2}\right) + n$.	08
4	a	Draw state transition diagram for the string matching automata that accept strings with "*ababaca*".	06
	b	Write and apply Bellman-Ford algorithm and find the shortest paths from the source vertex *A*.	

<div align="center">

OR

</div>

5	a	With algorithm, explain Knuth Morris Pratt prefix string matching algorithm. Generate prefix table for the pattern $P = ababaca$.	08
	b	Write and apply shortest path in a DAG for the given graph from source vertex '*a*' to vertex '*e*'.	

			08
6	a	Insert $10, 30, 25, 15, 22, 67$ into an empty red-black tree.	08

	b	Five coach drivers Mihi, Pat, Robert, Sarah and Tony, have to be assigned to drive five coaches for the following school trips:
		Adupgud senior school is going to lake district.
		Brayknee junior school is going to seaside.
		Korry Stur junior school is going to concert.
		Learalott senior school is going to museum.
		  i) Mihi and Sarah would like to drive senior school children.
		  ii) Robert and pat would like to go on a seaside trip.
		 iii) Pat and Tony would like to attend the concert.
		 iv) Robert and Pat would like to visit museum.
		  v) Pat and Tony would like to visit the lake district.
		   Draw a bipartite graph to show the trips that the drivers would like to do. Apply maximum bipartite matching algorithm and find mapping to each of them.
			08

<div align="center">

OR

</div>

7	a	Insert 1,2,3,4, ...,7,8 into empty binomial queue and delete minimum.	08
	b	Write and apply Ford Fulkerson algorithm to find maxflow for the given network.	
			08
8	a	Write and apply Euclid and extended Euclid algorithm to find $GCD(10,25)$.	10
	b	Consider RSA Key set with $p = 11, q = 29, n = 319$ and $e = 3$. What value of d should be used in the secret key? What is the encryption of the message $m = 100$?	06
		OR	
9	a	Apply Chinese remainder theorem to solve $a \equiv 4 \ (mod \ 5)$ and $a \equiv 5 \ (mod \ 11)$.	08
	b	Find the result of $7^{560} \ mod \ 561$	08
10	a	State and explain recursive algorithm of FFT and drive its complexity.	10
	b	Explain the following concepts:	
		i) Complex root of unity	
		ii) Butterfly operation	
		iii) Parallel FFT.	06
		OR	
11	a	Explain the implementation of iterative FFT.	08
	b	Explain interpolation of point value representations of polynomial. Convert {(0,1) (1,0) (2,5) (3,22)} to co-efficient form.	08

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-17
Computer Science and Engineering
FUNDAMENTALS OF COMPUTER VISION (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	How is Radio Band or waves used in Medical field?	01
	1.2	Continuously sensed data is converted to digital image by sampling, the function in both coordinates and in amplitude. Digitizing the coordinates values is called _____ and digitizing the amplitude value is called _____.	02
	1.3	List the operations performed by filters in image processing (any 4).	02
	1.4	Give the Mathematical representation for image formation which includes reflection and illumination.	01
	1.5	Construct a 3×3 filter that returns a positive value if the average value of the 4-adjacent neighbors is less than the center and a negative value otherwise.	02
	1.6	Analyze different ways of padding border effects after performing alteration on the image (any 4).	02
	1.7	In Electro Magnetic Spectrum, Remote Sensing uses _____ and _____.	02
	1.8	Bag of words is a _____ approach.	01
	1.9	List the techniques used in recognizion with segmentation.	02
	1.10	Active appearance models is based on _____ and _____.	01
	1.11	Give the Inverse Fourier equation.	01
	1.12	Differentiate between computer vision and computer Graphics.	01
	1.13	For the image segment as shown in Fig.1.13 consider $V = \{1, 3\}$. Compute the lengths of the shortest 8 adjacency path between p and q if a particular path does not exists explain why? $\begin{array}{cccc} 3 & 1 & 2 & 1^{(q)} \\ 1 & 2 & 0 & 1 \\ 1 & 2 & 3 & 1 \\ {}_{(p)}\,1 & 0 & 1 & 2 \end{array}$ Fig.1.13	02

PART-B

2	a	Exemplify the component of Image processing system with a neat diagram. Write any four points why mass storage capability is required in image application?	10

	b	Formulate the *m*-adjacency of nearest neighborhood. With relevant example, explain how ambiguity in 8 adjacency resolved by the use of m-adjacency? **OR**	06
3	a	Describe the electromagnetic spectrum in different bands with a neat diagram.	06
	b	Demonstrate how Positron Emission Tomoglaphy works (*PET*)?	04
	c	Exemplify the fundamental steps in Digital Image Processing with a neat diagram.	06
4	a	Spatial Filter the following image segment shown in figure below using a 3×3 Box filter by performing mirroring at the edges. $$\begin{bmatrix} 1 & 4 & 3 & 3 \\ 4 & 5 & 5 & 1 \\ 1 & 6 & 6 & 4 \\ 2 & 4 & 6 & 8 \end{bmatrix}$$	08
	b	With appropriate equations demonstrate atleast 4 Fourier transform pair (given function of $2D$ with their Fourier transform). **OR**	08
5	a	With necessary diagram explain the Fourier transform of Sampled signal, considering the condition that the Sampled signal intersects with each other.	08
	b	Explain the Algorithm used in image resampling.	04
	c	Write three properties of shift invariant.	04
6	a	Write the steps involved in Basic Global threshold to improve segmentation. For the image fragment as in figure below, apply Global threshold and find the segmented Image. $$\begin{bmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{bmatrix}$$	08
	b	Write the Algorithm to improve global thresholding using edges. **OR**	08
7	a	Apply Otsa's thresholding method to segment the image and find within clare variance and between clare variance considering the threshold $T = 3$ for the figure given below: $6 \times 6\ image$ <table><tr><td>0</td><td>0</td><td>1</td><td>4</td><td>4</td><td>5</td></tr><tr><td>0</td><td>1</td><td>3</td><td>4</td><td>3</td><td>4</td></tr><tr><td>1</td><td>3</td><td>4</td><td>1</td><td>2</td><td>3</td></tr><tr><td>4</td><td>4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr><tr><td>5</td><td>4</td><td>2</td><td>1</td><td>0</td><td>0</td></tr><tr><td>5</td><td>5</td><td>4</td><td>3</td><td>1</td><td>0</td></tr></table>	10

	b	How does smoothy improves Global Thresholding? Explain with suitable example.	06
8	a	With necessary equations explore mixture of Gausian approach for clustering.	08
	b	Identify and analyze the probabilistic and Graph based merging algorithm with necessary equations.	08
		OR	
9	a	Illustrate with the necessary equation non-parametric mean shift model for finding cluster in data set.	08
	b	Analyze the watershed method of segmentation. Give reasons to over come segmentation in watershed method.	08
10	a	Demonstrate AdaBoost Algorithm for training the dataset.	10
		How is the manipulation done using shape and color in the images?	06
		OR	
11	a	Describe with necessary equations eigen faces and eigen vectors.	10
	b	List and explain classification of category recognition.	06

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-17
Computer Science and Engineering
COMPUTER NETWORKS-I

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	The effectiveness of the data communication can be checked by _____, _____ and _____.	01
	1.2	Define multipoint link.	01
	1.3	The two factors that measure the network performance are _____ and _____.	01
	1.4	The device that permits electrical digital signals to be transmitted to a server over regular telephone lines is a _____.	01
	1.5	Assume 6 devices are arranged in a mesh topology. How many cables are needed? How many I/O ports are needed for each device?	02
	1.6	The power we use at home has a frequency of $60\,Hz$ ($50\,Hz$ in Europe). Calculate the period.	01
	1.7	If the frequency spectrum of a signal has a bandwidth of $500\,Hz$ with the highest frequency at $600\,Hz$, what should be the sampling rate, according to the Nyquist theorem?	01
	1.8	A periodic signal has a bandwidth of $20\,Hz$. The highest frequency is $60\,Hz$. What is the lowest frequency? Draw the spectrum if the signal contains all frequencies of the same amplitude.	02
	1.9	When a host on network A sends a message to a host on network B, which address does the router look at?	01
	1.10	The maximum length of the datagram is _____ bytes.	01
	1.11	The _____ layer ensures interoperability between communicating devices through transformation of data into a mutually agreed upon format.	01
	1.12	In Manchester and differential Manchester encoding, the transition at the middle of the bit is used for _____.	01
	1.13	_____ can be achieved by using multiplexing; _____ and _____ can be achieved by using spreading.	01
	1.14	A generator that contains a factor of _____ can detect all odd-numbered errors.	01
	1.15	*ARQ* means retransmission of data in three cases _____, _____ and _____.	01
	1.16	In Go-Back-N *ARQ*, if frames $4, 5$ and 6 are received successfully, the receiver may send an *ACK* _____ to the sender.	01
	1.17	In Go-Back-N *ARQ*, if 5 is the number of bits for the sequence number, then the maximum size of the send window must be _____ and the maximum size of the receive window must be _____.	01
	1.18	In the _____ controlled access method, all data exchanges must be made through the primary device even when the ultimate destination is a secondary device.	01

PART-B

2	a	Differentiate between data and information. What are the different forms in which data can be represented?	04
	b	Describe simplex, half-duplex, and full duplex methods of data flow with neat diagrams and example of each.	06
	c	Discuss the Baseband and Broadband transmission.	06

OR

3	a	Define data communication. Discuss the four fundamental characteristics of data communication.	04
	b	Discuss the modulation of a digital signal for transmission on a bandpass channel with neat diagram.	06
	c	Describe the causes of impairment.	06

4	a	Why is Scrambling required? With supporting diagrams explain the $B8ZS$ and $HDB3$ Scrambling techniques.	08
	b	Discuss the different transmission modes in detail with diagrams.	08

OR

5	a	What is line coding? Discuss the characteristics of line coding schemes.	08
	b	With neat diagrams, explain synchronous and statistical time division multiplexing. Also show the slot comparison for both techniques.	08

6	a	Discuss the interaction between layers in the OSI.	06
	b	Demonstrate CRC encoder and decoder with diagram.	06
	c	Write the steps to calculate the internet checksum on the sender site and receiver site.	04

OR

7	a	Demonstrate with diagrams Hop-to-hop delivery and Source-to-destination delivery.	06
	b	Given the dataword$(x^7 + x^6 + x^5 + x^2 + 1)$ and divisor $(x^4 + x^3 + x + 1)$, show the computation of CRC using polynomial division method.	06
	c	Categorize the responsibilities of Session layer and Presentation layer.	04

8	a	Illustrate the sliding window and algorithm for Go-Back-N automatic repeat request protocol.	10
	b	Explain the transition phases with diagram.	06

OR

9	a	Illustrate the design and algorithm for Selective Repeat Request protocol.	10
	b	Explain the three types of frames used in $HDLC$ protocol.	06

10	a	Discuss with flow diagram Carrier Sense Multiple Access with Collision Detection ($CDMA/CD$).	06
	b	Explain with frame format, $IEEE$ 802.3 MAC sub-layer protocol.	06
	c	Demonstrate binary exponential back – off algorithm.	04

OR

11	a	What is channelization? Demonstrate on Frequency Division Multiple Access ($FDMA$).	04
	b	Discuss $IEEE$ 802.11 MAC sub layer protocol in detail.	06
	c	Explain the three persistence methods in $CSMA$.	06

R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-17
Computer Science and Engineering
MICROPROCESSOR AND MICROCONTROLLER

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	8086 microprocessor supports _____ bit ALU.	01
	1.2	8086 microprocessor consists of _____ number of segment registers and size of each segment is _____.	02
	1.3	_____ flag is set to enter processor into a single step execution mode.	01
	1.4	What is the indication if the contents of status lines $\overline{S_2}\,\overline{S_1}\,\overline{S_0}$ is 010.	01
	1.5	Suppose the processor wants to fetch first byte of opcode from the queue, then what is the contents of QS_1 and QS_0.	01

	1.6	Name the addressing mode for following instructions:
		  i) $MOV\ AX, 1234H$
		  ii) $MOV\ AX, [1234H]$
			02

	1.7	Assume the contents of $AX = 0102H$. What is the content of AL register after execution of AAD instruction.	01
	1.8	Suppose the content of register $AL = 12H$, write set of instructions to swap the digits of AL using rotate instructions.	02
	1.9	Name the directives which can directs the assembler to start the memory allotment for the particular segment.	01
	1.10	What number of address lines are required for the $8k\ bytes$ of memory.	01
	1.11	Illustrate the difference between NOT and NEG instruction in 8086.	02
	1.12	Calculate the control word to initialize port A as simple output, port B as simple input, and port C as simple output.	01
	1.13	The 8051 has _____ number of I/O lines.	01
	1.14	$MOV\ A, R_4$ is an example for _____ addressing mode.	01
	1.15	Write 8051 instructions to add two BCD numbers and store the result in BCD in register R_1.	02

PART-B

2	a	With a neat block diagram explain the 8086 architecture in detail.	10

	b	Explain the following signals of 8086:
		  i) NMI
		  ii) $READY$
		  iii) $DT/\overline{R}$
			06

		OR	

3	a	Describe the minimum mode operation of 8086 system with a neat diagram.	10
	b	Write and explain read cycle timing diagram for minimum mode operation of 8086.	06
4	a	Explain with example indexed and based indexed addressing mode of 8086 microprocessor.	04

	b	With an example explain the following instructions:
		  i) *LEA*
		  ii) *ADC*
		  iii) *CBW*.
			06

	c	Write an assembly language program to display message "Happy New Year" on the screen after a key *D* is pressed.	06

OR

5	a	With programming example explain the *MOVSB* and *CMPSB* string instructions.	08

	b	Explain the following instructions with example:
		  i) *PUSH*
		  ii) *CMP*
		  iii) *NEG*
		  iv) *SAR*.
			08

6	a	Write an assembly language program to display two messages "8086" and "microprocessor". Use the macro definition to display first message and procedure definition to display second message.	08
	b	With a neat block diagram explain the structure of interrupt vector table 8086.	08

OR

7	a	Explain the I/O mode control word format of 8255.	06

	b	Design a stepper motor controller and write an assembly language to rotate shaft of a 4 phase stepper motor:
		  i) In clockwise 5 rotations
		  ii) In anticlockwise 5 rotations.
			10

8	a	Explain the following addressing modes of 8051 with example:
		  i) Immediate
		  ii) Register
		  iii) Indirect addressing
		  iv) Absolute addressing
		  v) Bit inherent addressing.
			10

	b	Write a 8051C program for:
		  i) Send *ASCII* character ($'\wedge', '\omega', '!', '*'$) through $P_0, P_1, P_2, \& P_3$ respectively.
		  ii) Read data from port 1. If the data is equal to $20H$, send FFH to port 2, otherwise send OOH to port3.
			06

OR

9	a	Explain in detail internal and external memory system of 8051.	10
	b	Write an 8051 assembly language program to create a delay of 1 second. Assume the oscillator frequency is 12*MHz*.	06
10	a	Interface *DAC*08 and write assembly language program to generate square wave.	08
	b	Write an interface circuit for matrix keypad and explain the working of the same using a code fragment.	08

OR

11	a	Explain the synchronous and asynchronous serial data communication in detail.	08
	b	Discuss four operation modes of 8051 serial communication.	08

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R. V. COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-17
Computer Science and Engineering
DATABASE MANAGEMENT SYSTEMS

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 normalization? Give any two reasons why normalization is needed?	02
	1.2	For the following relation schema R and set of functional dependencies F, list all candidate keys. $R(A, B, C, D, E)$ & $F = \{AC-> E, B-> D, E-> A\}$	02
	1.3	Consider a relation $R(A, B, C, D)$ with following instances:	

A	B	C	D
1	1	2	3
1	2	2	3
1	3	2	3
2	4	5	6
5	6	7	8

		Justify whether the following functional dependencies are satisfied by this relation? i) $A \rightarrow CD$ ii) $AD \rightarrow BC$.	02
	1.4	List three different ways of mapping 1:1 relationship types in ER to relational mapping.	02
	1.5	Define recursive relationships and the need of role names in recursive relationship.	02
	1.6	Summarize two types of participation constraints with examples.	02
	1.7	Differentiate between partial key and candidate key.	02
	1.8	Identify complete set of relational algebra operations. Represent the join operation using set of relational algebra operators.	02
	1.9	Consider two sets of FDs (Functional Dependencies) F and G and evaluate whether the two FDs are equal. $F = \{ A \rightarrow B, B \rightarrow C, AC \rightarrow D \}$ $G = \{ A \rightarrow B, B \rightarrow C, A \rightarrow D \}$	02
	1.10	Consider $R\ (A, B, C)$ and $S\ (D, E, F)$ be two relational schemas. If $r(R)$ and $s(S)$ represents relations, then provide equivalent SQL statements for the following relational algebra queries. i) $\sigma_{B=17}(r)$ ii) $\pi_{A,F}\big(\sigma_{C=D}(r \times s)\big)$	02

PART-B

2	a	Design a *ER* diagram for the National Kabbaddi league(*NKL*) data base with the following constraints: i) *NKL* has many teams. ii) Each team has a name, a city, a coach, a captain and a set of players. iii) Each player has a name, address and a set of injury records. iv) A ream captain is also a player. v) A game is played between two teams (referred to as host team and guest team) and has a date (such as 11th June 2016) and a score. List the assumptions made and clearly indicate the cardinality mappings as well as role names were ever required.	08
	b	Explain with a neat diagram the component modules of *DBMS* and their interactions.	08

OR

3	a	Construct an *ER* diagram managing a simple database at hospital with following constraints: i) A group of physicians are responsible for admitting patients. ii) All the physicians will treat patients. iii) Each new patient is admitted by exactly one physician, who may or may not be the admitting physician. iv) Hospital wishes to record the details of the treatment including date, time, results, whenever a patient is treated by a physician. List the assumptions made and clearly indicate the cardinality mappings and participation constraints wherever appropriate.	08
	b	Differentiate between logical data independence and physical data independence. Which one is harder to achieve and why?	08
4	a	Consider the following schema Sailors(<u>sid : integer</u>, sname : string, rating : integer, age : real); Boats(<u>bid : integer</u>, bname : string, color : string); Reserves (<u>sid : integer, bid : integer</u>, day : date); Write the following queries in *SQL* i) Find all information of sailors who have reserved boat number 104 ii) Find the names of sailors who have reserved a red boat and list them in the order of age. iii) Find the name and the age of the youngest sailor. (Use *ALL* keyword).	08
	b	Consider the following relations: Student(<u>ssn</u>, name, address, major) Course (<u>code</u>, title) Registered (<u>ssn</u>, <u>code</u>) Write the following queries using relational algebra notations. i) List the codes of courses for which no students have registered. ii) List the names of students and titles of courses they have registered to. iii) List the *SSNs* of students who are registered for both "*DBMS*" and "Analysis of Algorithms" courses.	08

5	a	Consider the following relations:
		Employee (<u>person_name</u>, street, city)
		Works (<u>person_name</u>, company_name, salary)
		Company(<u>company_name</u>, city)
		Manager(<u>person_name</u>, manager_name)
		Design the relational algebra expressions for the following queries.
		    i) Find the names and cities of all employees who work for ABC bank Corporation.
		    ii) Find the names, street address and cities of residence of all employees who work for ABC Bank Corporation and earn more than \$10,000 per annum.
		    iii) Find the names of all employees in this database who live in the same city as the company for which they work.
			08

b — Consider the following tables $T1, T2$ and evaluate the following relational algebra expressions.

P	Q	R
11	X	5
35	Y	8
25	X	6

$T1$

A	B	C
11	Y	6
25	Z	3
11	Y	5

$T2$

    i) $T1 \ltimes_{T1.P \,=\, T2.A} T2$

    ii) $T1 \rtimes_{T1.R \,=\, T2.C} T2$

    iii) $T1 \bowtie_{T1.R \,=\, T2.C} T2$

    iv) $T1 \bowtie_{T1.R \,=\, T2.B} T2$ **08**

6	a	Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies $G = \{\{A, B\} \rightarrow \{C\}, \{B, D\} \rightarrow \{E, F\}, \{A, D\} \rightarrow \{G, H\}, \{A\} \rightarrow \{I\}, \{H\} \rightarrow \{J\}\}$ What is the key for R? Decompose R into $2NF, 3NF$ relations.	08
	b	Differentiate between Embedded $SQLJ$ and Embedded SQL.	04
	c	Find the Minimal cover for the following set of functional dependencies. $AB \rightarrow D, B \rightarrow C, AE \rightarrow B, A \rightarrow D, D \rightarrow EF$	04

OR

7	a	Define closure of an attribute.	02
	b	Consider a relation $R = (A, B, C, D, E)$. Decompose R into $R_1 = (A, B, C)$ and $R_2 = (A, D, E)$. It has the following set of functional dependencies $A \rightarrow BC, CD \rightarrow E, B \rightarrow D$ and $E \rightarrow A$. show that this composition is a lossless-join decomposition.	04
	c	List and explain all the informal design guidelines for relation schemas.	10

8	a	Explain access mode, diagnostic size and isolation level in SQL transaction. Explain transaction states using state transition diagram.	10

	b	What is serializable schedule? Explain with an example how to test conflict serializability?	06
		OR	
9	a	Illustrate two different deadlock prevention protocols.	08
	b	Identify and explain all the variations of two phase locking protocol.	08
10	a	What are different types of discretionary privileges? Explain typical security classes in Mandatory Access Control.	10
	b	Explain the following *DBMs* recovery terminology for writing page to disk from cache. 　i)　　Steal/No steal approach 　ii)　　Force/No force approach.	06
		OR	
11	a	Explain the concept of shadow paging.	08
	b	Compare and contrast Discretionary Access Control and Mandatory Access Control policies.	08