BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2010-2011

Sub : **CSE 401** (Artificial Intelligence)

Full Marks: 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) What are the differences between supervised and unsupervised learning? Define reinforcement learning.   **(5)**

    (b) The accuracy of an opinion poll is 98.5%. The poll is used to determine the popularity of a certain candidate X for the national election. Collected data shows that 3 in 5 people are in favor of the candidate. Find the followings–   **(10)**

      (i) probability that the candidate is elected given the opinion poll is against the candidate.

      (ii) probability that the candidate is defeated given the opinion poll is in favor of the candidate.

    (c) State Ockham's razor. Show that for any PAC-learning algorithm $N \geq \frac{1}{\epsilon}(\ln|H| + \ln|\frac{1}{\delta}|)$ where symbols have their usual meanings.   **(10)**

    (d) Describe the steps of a decision-theoretic agent. How is a poly-tree in a Bayesian Network converted into a singly-connected tree? Give an example.   **(10)**

2. (a) Describe two strategies to speed up the resolution process of predicate logic.   **(6)**

    (b) Explain the problem with the following unification.   **(5)**

      (i) SpringRevolution (2011, egypt, X1)

      (ii) SpringRevolution(T1, C1, President(X1, Since(T2))).

    Substitute: {President(X1, Since(T2))/X1} {egypt/C1} {2011/T1}

    (c) Convert the following sentences into predicate form and then, into clause form and hence build a knowledge base: **(16+8=24)**

      (i) If a category 5 cyclone hits a country's coastline in any time, high waves submerge area within 5 kilometers of the coastline and high velocity wind knocks down every house within 5 kilometers of the coastline at that time.

      (ii) If high waves submerge an area in any time, any person living in that area who does not go to the cyclone shelter will drown at that time.

      (iii) If high velocity wind knocks down a house in any time, any person living in that house is crushed at that time.

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CSE 401

Contd ... Q. No. 2(c)

(iv) Any person who is drowned or crushed in any time dies at that time.

(v) A category 5 cyclone hit the coastline of Bangladesh on April 29, 1991.

(vi) Hamidur Rahman lived in Patenga on April 29, 1991.

(vii) Patenga is within 5 kilometers of coastline.

(viii)Hamidur Rahman did not go to the cyclone center.

Using the above knowledge base, answer the following query by the method of resolution:

When did Hamidur Rahman die?

3. (a) Studies about the migratory behavior of Siberian crane (bird) found the following: **(8+12+8=28)**

Two factors mainly control the success of Siberian cranes in crossing the Himalayan mountains - weather condition of the mountain and the birds' timely arrival in the mountain regions. The probabilities that the cranes will cross the Himalayan mountains successfully are 90%, 80%, 75% and 45% respectively if both the weather condition in the Himalayas is good and the birds have arrived in time, if only the weather condition in the Himalayas is good, if only the birds have arrived in time and if both of the causes are absent. The probabilities that the weather condition is good during the migration and that the birds arrive there in time are 50% and 95% respectively. Whether the birds will reach our country depends on two factors- their successful crossing of the Himalayan region and sunny weather in our country during the migration. The prior probability of sunny weather in our country during migration is 55%. The probabilities that the bird will reach our country 84%, 78%, 52% and 45% respectively if both the birds crossed the Himalayas successfully and the weather here is sunny, if only the birds crossed the Himalayas successfully, if only the weather is sunny and if none of the factors are true.

The probabilities that the bird flu will spread in our country are 30% and 24% respectively due to the presence of Siberian crane and due to other causes.

(i) Draw a Bayesian Network that represent the above scenario correctly.

(ii) Using Variable Elimination algorithm, find the probability that Siberian cranes have reached the Himalayas in time if bird flue has spread in our country.

(iii) Using variable elimination algorithm, find the probability that Siberian cranes will reach our country if the birds fail to reach the Himalayas in time and if the weather of the Himalayan region is bad.

(b) What are the underlying assumptions of Bayesian network? Define Markov blanket for a node in Bayesian network. **(4+3=7)**

CSE 401

4. (a) Suppose following predicates describe the environment of blocks completely. **(8)**

   ON(A,B) – Block A is on block B.

   ONTABLE(A) – Block A is on the table.

   CLEAR(A) – There is nothing on top of block A.

   HOLDING(A) – The arm is holding block A.

   ARMEMPTY – The arm is holding nothing.

Now define the precondition, add-list and delete-list for the following action as a precursor to goal stack planning;

   (i)   STACK(X, Y).

   (ii) UNSTACK (X, Y).

   (iii) PICKUP (X)

   (iv) PUTDOWN (X).

(b) Using the goal stack planning and the actions defined in 4(a), attain the goal state from the initial state as shown in Figure for 4(b). **(15)**

Figure for 4(b)
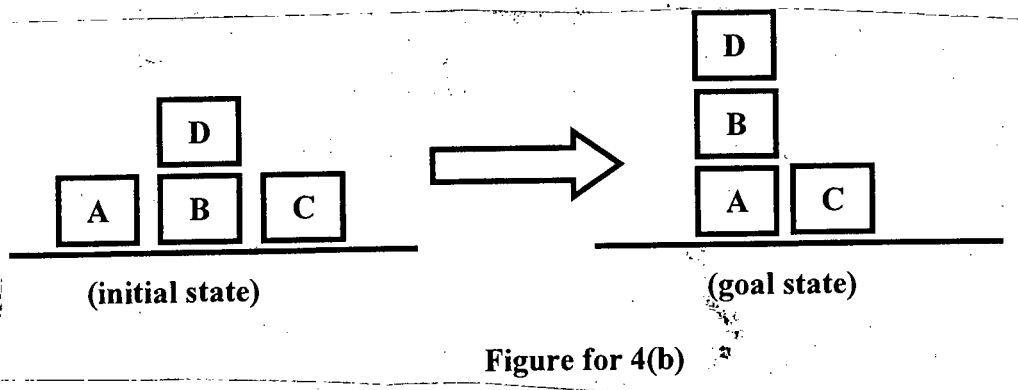
(c) What are the five operations involved in TWEAK planning framework. **(10)**

(d) What is the difference between linear and non-linear planning? **(2)**

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Consider the problem of sorting four numbers in ascending order. You are only allowed to swap two adjacent elements. You are to solve this problem in minimum number of swaps. **(4×5=20)**

   (i)   Write down- State representation, Initial state, Goal state, Operations and Path Cost.

   (ii) How many states are there in your representation?

   (iii) For this problem let the heuristic be-sum of the distance between original and correct place of a number. If the starting state is "4, 1, 3, 2", draw the search tree for A* algorithm.

   (iv) Is the heuristic described in (iii) admissible? If yes, explain why; if not, propose an admissible heuristic.

(b) Consider the game tree in Figure 5b. Using ALPHA-BETA pruning determine the value for the root node. Also specify which branches are pruned by the algorithm. While expanding a node, children should be visited from left to right. **(15)**

CSE 401

6. (a) Consider the problem of assigning Red(R) and Green(G) colors to five squares on board in Figure 6a such that horizontally or vertically adjacent squares do not have the same color. **(3×6=18)**

    (i) State the variables, domains and constraints for this problem.

    (ii) If initially Red color is assigned to square 1, what is the result of "Forward Checking" algorithm?

    (iii) If initially Green color is assigned to square 5, what is the result of "Arc Consistency Checking" algorithm?

(b) Initially you are given a number X inclusively between 1 and 7. At each turn you can perform one of these three moves: **(17)**

    (i) Multiply by 2.

    (ii) Multiply by 2 and then add 1.

    (iii) Divide by 2 and keep the integer part.

If the resulting number is not between 1 and 7 inclusive, the number remains the same. If some one wants to get 6, what will be the operation sequence? Draw the corresponding belief state diagram.

7. (a) Perform Recursive Best First Search (RBFS) and Iterative Deepening A* Search (IDA*) algorithm to reach the goal state G from the initial state S for the graph and the heuristic values in Figure 7a. **(12½×2=25)**

(b) There are two types of Ludo. Traditional Ludo and Snake ludo. You are asked to analyze their environments. Describe the environments of both Ludo with explanation. **(10)**

8. (a) Perform the following searching algorithm in Figure 8a from initial state S to Goal State G. **(20)**

    (i) Breadth First Search (Right move has higher priority than Down)

    (ii) Depth First Search (Right move has higher priority than Down)

    (iii) Depth First Search (Down move has higher priority than Right)

(b) What is the advantage of Breadth First Search (BFS) over Depth First Search (DFS)? Also state the advantage of DFS over BFS. **(8)**

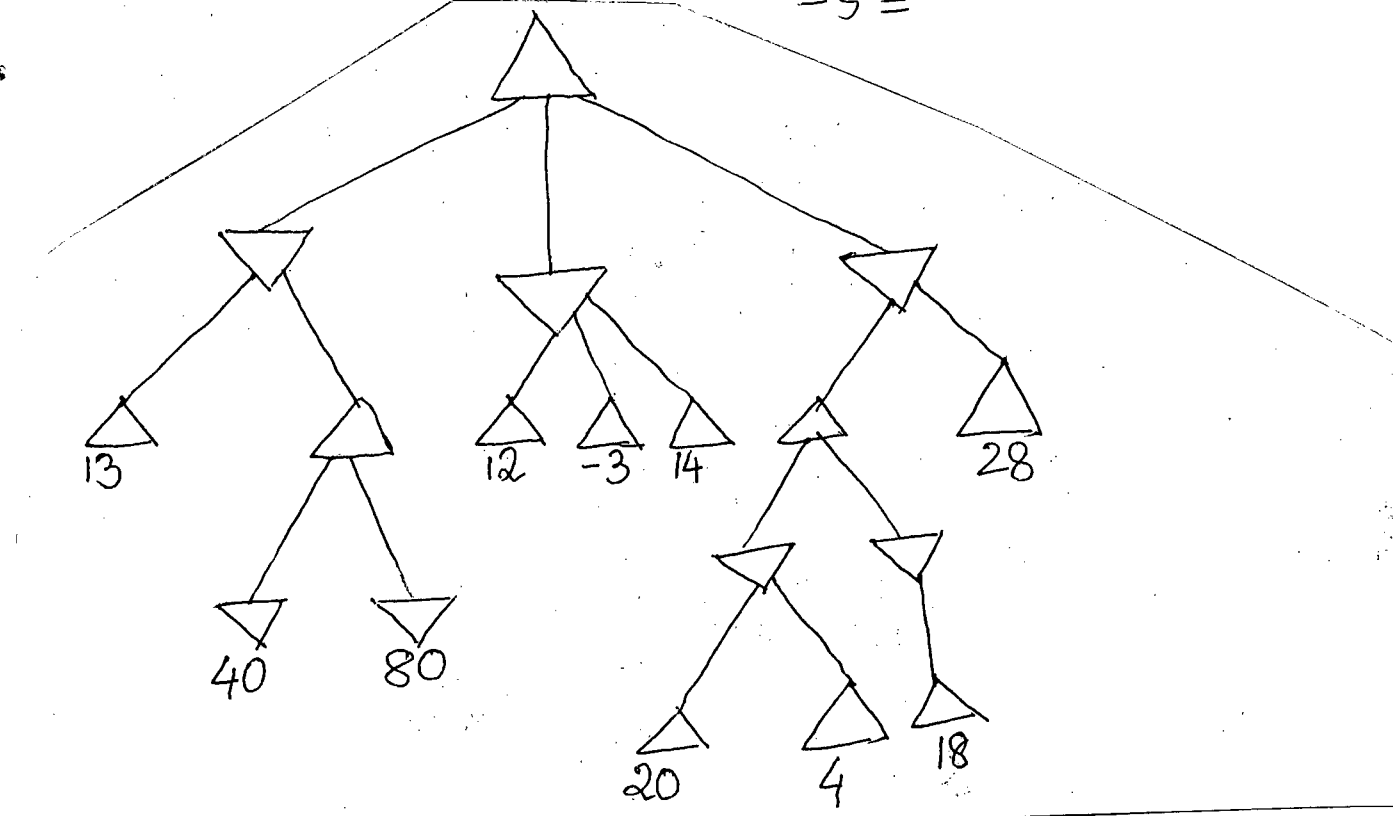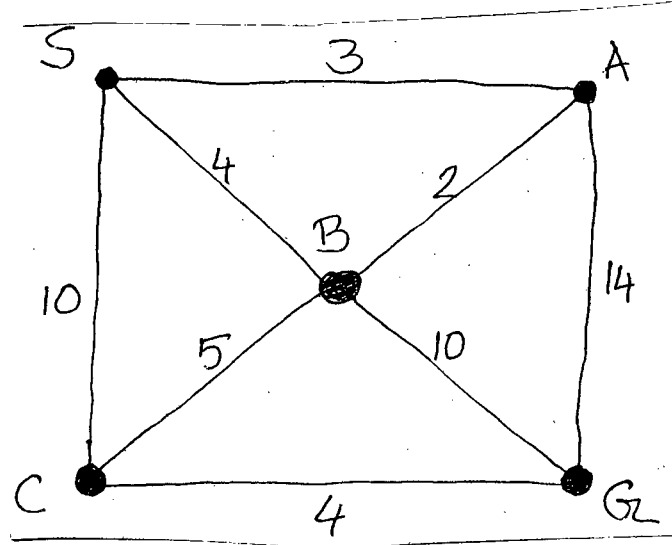(c) What is the meaning of completeness and optimality of a searching algorithm? **(7)**

figure 5b

figure 6a

Heuristic values

$h(S) = 10$
$h(A) = 7$
$h(G) = 0$
$h(C) = 2$
$h(B) = 7$

figure 7a

figure 8a

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2010-2011

Sub : **IPE 493** (Industrial Management)

Full Marks : 210   Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.
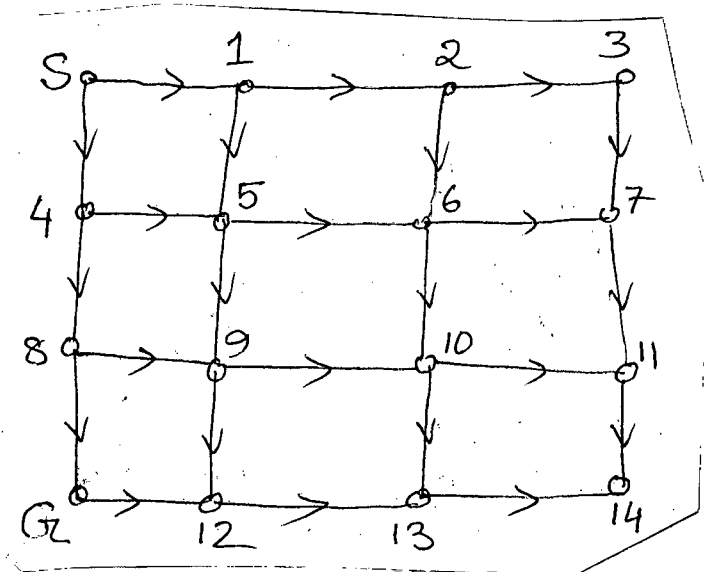

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Consider the following problem.   **(25)**

$$\text{Minimize} \quad z = 3x_1 + 2x_2 + 4x_3$$

Subject to,

$$2x_1 + x_2 + 3x_3 \quad = 60$$
$$3x_1 + 3x_2 + 5x_3 \quad \geq 120$$

$$\text{and} \quad x_1 \geq 0 \;, x_2 \geq 0 \;, x_3 \geq 0$$

Using the Big M method, work through the simplex method to solve the problem.

(b) Identify market leader and market challenger in the following product market: **(10)**

(i) Internet search

(ii) Personal computers processor

(iii) Web browser

(iv) Social networking site

(v) Antivirus software

2. (a) Suppose you are planning to make two deposits, $ 25,000 now and $ 30,000 at the end of six years. You want to withdraw C each year for the first six years and (c + $ 1,000) each year for the next six years. Determine the value of C if the deposits earn 10% interest compounded annually.   **(18)**

(b) Selling of Djuice sim (a product of Grameen phone) follows the bell shaped PLC curve. Do you agree? Justify your answer.   **(7)**

(c) Draw the leadership grid and identify different types of leadership in it.   **(10)**

3. (a) Suppose, you're the owner of a company. You need to recruit few employees for your company from outside. What are the available sources of recruitment for you?   **(12)**

(b) Buying of a house or an apartment is an example of habitual buying behavior. Do you agree? If not, give reasons behind your opinion.   **(8)**

(c) Suppose, you are a manager of a company. An employee under your supervision often comes late in the office. How can you apply reinforcement theory of motivation to change this behavior?   **(7)**

(d) What do you understand by conceptual skill? An office executive needs conceptual skill more than any other skills to perform his day-to-day office job. Do you agree? Justify your answer.   **(8)**

IPE 493(CSE)

4. (a) What are the competitive strategies under which market followers conduct their marketing activities? Give appropriate examples. **(10)**

(b) What do you understand by 'halo error'? **(5)**

(c) Michigan Polar Products makes downhill and cross-country skis. A pair of downhill skis requires 2 hours for cutting, 1 hour for shaping and 3 hours for finishing while a pair of cross-country skis requires 2 hours for cutting, 2 hours for shaping and 1 hour for finishing. Each day the company has available 140 hours for cutting, 120 hours for shaping and 150 hours for finishing. How many pairs of each type of ski should the company manufacture each day in order to maximize profit if a pair of downhill skis yields a profit of $ 10 and a pair of cross-country skis yields a profit of $ 8? **(20)**

SECTION – B
There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) The following table contains the demand from the last 10 months. **(26)**

Month	Actual Demand
1	31
2	34
3	33
4	35
5	37
6	36
7	38
8	40
9	40
10	41

(i) Calculate the single exponential smoothing forecast for the last six months using an α of .30 and an initial forecast of 35.

(ii) Calculate the exponential smoothing with trend forecast for the last six months using an α of .30 and β of .30.

(iii) Calculate MAPE for each forecast.

(iv) Which forecasting technique is the best? Justify your answer with appropriate logic.

(b) Table is a standard item in a company's inventory and assembly of table is performed on an assembly line that is in operation everyday. One component of table is produced in another department. This department when it produces the components at the rate of 110 units per day, the assembly line uses the component at the rate of 55 units per day. Given the following data what is the optimal lot size for production of the component? Assume 260 working days.

Cost for production setup = $ 60

Annual holding cost = $ .50 per unit

Cost of component $ 7 each

Lead time = 7 days. **(9)**

IPE 493(CSE)

6. (a) An assembly line is to be designed to operate 7 $\frac{1}{2}$ hours per day and supply a steady demand of 300 units per day. Here the tasks and their performance times. **(30)**

Task	Preceding Task	Performance time (second)	Task	Preceding Task	Performance time (second)
a	-	70	g	d	60
b	-	40	h	e	50
c	-	45	i	f	15
d	a	10	j	g	25
e	b	30	k	h, i	20
f	c	20	l	j, k	25

(i) Draw the precedence diagram.

(ii) What is the cycle time?

(iii) What is the theoretical minimum no of workstations?

(v) Assign tasks to workstation using any heuristics and mention the name of the heuristics you use.

(v) What is the efficiency of your line balance?

(vi) Suppose demand increases by 10% how would you react?

(b) Write down the differences between Fixed Order Quantity Model and Fixed Time period Model. **(5)**

7. (a) Differentiate between "cost of control" and "cost of failure to control". Briefly explain Appraisal cost and Internal failure cost. **(6)**

(b) Write down the names of basic six types of histogram. Briefly define them with appropriate figures. **(6)**

(c) What is a "fishbone diagram"? What are the two types of (most widely used) CE diagrams? Give an example of process type CE diagram with an appropriate figure. **(6)**

(d) Okabee Enterprise sells two products. Model A 100 and B 200. Monthly sales and CM ratios for the products follow: **(17)**

	Product		
	Model A 100	Model B 200	Total
Sales	$ 700,000	$ 300,000	$ 1000,000
CM ratio	60%	70%	?

The company's fixed expenses total $ 598, 500 per month.

Required: (1) Prepare an income statement for the company as a whole.

(2) Compute the breakeven point for the company based on current sales mix.

(3) If sales increase by $ 50,000 per month, by how much would you expect net operating income to increase?

8. (a) What are the differences that can complicate the tasks of effectively coordinating work activities? **(10)**

(b) What are two different sets of assumptions about employees identified by McGregor. **(10)**

(c) What are the findings of Ohio State University and University of Michigan about leadership style? Are the findings similar? Explain. **(15)**

L-4/T-1/CSE   Date : 29/02/2012
BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-4/T-1   B. Sc. Engineering Examinations 2010-2011
Sub : **HUM 213** (Government)
Full Marks : 140   Time : 3 Hours
The figures in the margin indicate full marks.
USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A
There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) How do you define state? What are the elements of a state?   **(11⅓)**

   (b) Discuss different types of constitution with examples.   **(12)**

2. (a) What is meant by the term 'nationality 'nation' and 'nationalism'? Discuss the demerits

   of nationalism.   **(11⅓)**

   (b) Examine the strengths and weaknesses of democracy.   **(12)**

3. (a) Analyze the different methods for acquiring citizenship.   **(11⅓)**

   (b) Describe the safeguards of citizen rights in a state.   **(12)**

4. (a) What are the different kinds of executive? Explain the role of executive in a state.   **(11⅓)**

   (b) Discuss the functions of Legislature as an organ of government.   **(12)**

SECTION – B
There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) What is meant by good governance? Briefly analyze the problems of governance in

   South Asia.   **(11⅓)**

   (b) Define bureaucracy. What do you know about Max Weber's "Ideal Type of

   Bureaucracy"?   **(12)**

6. (a) Discuss the principle of Marxism with relevant criticism.   **(11⅓)**

   (b) Analyze the functions of Union Parishad as a local government institution in

   Bangladesh.   **(12)**

7. (a) Review the internal and external determinants of the foreign policy of Bangladesh.   **(11⅓)**

   (b) Explain the salient features of the constitution of Bangladesh.   **(12)**

8. (a) Discuss the impact of 1970 election on the emergence of Bangladesh.   **(11⅓)**

   (b) Make a comparative discussion between the political systems of UK and USA.   **(12)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2010-2011

Sub : **HUM 411** (Business Law)

Full Marks : 140   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Define and classify Negotiable Instrument. Describe some of its essential features.   **(12)**

   (b) What is a Bill of Exchange? Indicate the various parties involved in such an instrument.   **(3⅓)**

   (c) What is a Stale cheque? Show the various grounds on which a cheque may be dishonoured.   **(8)**

2. (a) Define and classify Company as per Companies Act, 1994.   **(15)**

   (b) Distinguish between Partnership and Limited Company.   **(8⅓)**

3. (a) What is Partnership? Explain its various features in a nutshell.   **(12)**

   (b) Describe the various mode of dissolution of a partnership firm.   **(8)**

   (c) Mention any two limitations of an unregistered partnership firm.   **(3⅓)**

4. Write short notes [any TWO]   **(23⅓)**

   (a) Acceptance

   (b) Memorandum of Association

   (c) Registration of a partnership firm.

   (d) Bailment

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Define the term 'Factory' and 'worker' as per Factories Act, 1965.   **(8⅓)**

   (b) Give a brief outline of various welfare measures to be adapted in a factory for the workers.   **(15)**

6. (a) Define the term 'Compensation' and 'Workman' as per Workman's Compensation Act. Who are eligible to get the compensation claim due to an injured or deceased workman?   **(10)**

   (b) Describe the circumstances under which an employer is liable to pay compensation and where he can reduce to pay the same.   **(13⅓)**

HUM 411

7. (a) Define 'Wages' and 'Bonus' as per Payment of Wages Act, 1923.   **(8⅓)**

   (b) Briefly describe the provisions regarding deduction from the wages of a worker on account of absence from duty.   **(15)**

8. Write short notes on : (any TWO)   **(23⅓)**

   (a) Labour Court

   (b) Strike and Lockout

   (c) Total Disablement

   (d) Unfair Labour Practice

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2010-2011

Sub : **HUM 211** (Sociology)

Full Marks : 140   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) 'Sociology is the study of social relationship' – justify this statement on the basis of nature of sociology. **(10)**

    (b) Explain the main theme of functionalist theoretical perspective of sociology. **(13⅓)**

2. (a) What is social stratification? Explain the class system of social stratification. **(10)**

    (b) 'The history of all hitherto existing societies is the history of class struggle' – explain this statement on the basis of Karl Marx's theory of social stratification. **(13⅓)**

3. (a) What do you understand by socialization? Discuss different types of socialization. **(10)**

    (b) What is meant by deviance? Briefly discuss the cultural transmission theory of deviant behaviour. **(13⅓)**

4. Write short notes on any three of the following: **(23⅓)**

         (a) Social mobility

         (b) Looking glass self theory

         (c) Ethnocentrism

         (d) White collar crime

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) What is globalization? Critically discuss the factors that are contributing to the increase of globalization. **(8)**

    (b) Write down the differences between Oriental society and Occidental society. **(8)**

    (c) What are the major effects of rural to urban migration? **(7⅓)**

HUM 211

6. (a) What are the socio-cultural factors that influence population growth? Describe in detail. **(6)**

   (b) Write down the factors that have led to the growth of cities. **(10)**

   (c) Discuss the classification of cities with examples. **(7⅓)**

7. (a) How do you define greenhouse and greenhouse gases? **(6)**

   (b) Explain the significance and role of physical environment in social development. **(10)**

   (c) Show how the technological developments have changed our social and economic life. **(7⅓)**

8. Write short notes on any <u>three</u> of the following: **(23⅓)**

   (a) Evolution of city life

   (b) Potential consequences of global warming

   (c) Types of pollution

   (d) Sources of social change

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2010-2011

Sub : **CSE 435** (Basic Multimedia Theory)

Full Marks : 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) What are the characteristics of real time systems? How do multimedia systems deviate from real time systems?   **(10)**

    (b) Write short note on resource reservation and resource allocation for multimedia calls.   **(10)**

    (c) Describe the basic principles of SCAN-EDF algorithm for multimedia file system. Consider the following requests with specific deadlines: **(15)**

Request #	1	2	3	4	5	6	7	8	9	10
Deadline	1	1	2	1	2	2	3	2	3	3
Block #	22	10	15	18	30	42	25	35	45	50

    Show the sequence of serving the requests using SCAN-EDF algorithm.

2. (a) What are the main requirements of H.261 video coding standards? Describe how compression techniques satisfy these requirements.   **(10)**

    (b) What are the basic motivations behind MPEG-1 standard as an asymmetric compression technique? Describe the roles of different types of frames in MPEG-1 coding technique.   **(10)**

    (c) How do you calculate the motion using motion vectors extracted from MPEG-1 stream? Show with example.   **(15)**

3. (a) What do you mean by true Digital Television system? Describe the detailed architecture of Digital Television System to provide Bangladeshi TV channels abroad.   **(10)**

    (b) Classify continuous media stream based on time interval between packets and variation of packet amount. Give a practical example of each type of media stream.   **(10)**

    (c) Describe different methods of controlling animations with examples.   **(15)**

CSE 435

4. (a) What is flicker? How can flicker be reduced in video display unit? **(10)**

    (b) Consider following four components of an image: **(10)**

$H_1 = 500$	$H_2 = 250$	$H_3 = 500$	$H_4 = 250$
$V_1 = 300$	$V_2 = 300$	$V_3 = 150$	$V_4 = 150$

    Here, H_i = resolution in horizontal axis

    V_i = resolution in vertical axis

    Write down the pixels in correct sequence for the first two blocks indicating the Minimum Coded Units.

    (c) Discuss different steps of compression taken in JPEG image compression standard. **(15)**

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Discuss different types of transparent and non-transparent video scaling techniques with examples. **(8)**

    (b) Show the protocol suit for multimedia communications using RTP. Justify the usage of these protocols describing their functionalities in brief. **(12)**

    (c) Discuss the method of triangular negotiation in multimedia call establishment. Suppose that two persons residing in two countries are connected to the Internet. The first person is located in Bangladesh and is using a dial-up connection, whereas the other person is using a gigabit fibre link in USA. Show the triangular negotiation when the person in USA wants to utilize his/her full capacity to enjoy a video chat with the person in Bangladesh. Assume capacities of different entities to demonstrate the negotiation. **(15)**

6. (a) What are the issues in supporting multimedia database in addition to regular database management system? How can you introduce the principle of uniformity through media abstraction? **(8)**

    (b) Describe the soft state reservation in RSVP with necessary examples. Why is it necessary in signalling in the context of Internet? **(12)**

    (c) Describe path and reservation messages of RSVP signalling. Consider the network in Figure 6.c having routes R_1, R_2, R_3, R_4 and hosts H_1, H_2, H_3 and H_4. H_1, H_3 and H_4 wants to send audio with rate b_1, b_2 and b_4, respectively. Receiver H_2 sends reservation message for source H_3 and H_4. H_3 sends reservation message for source H_1 and H_4. Show the states of the routers with respect to path and reservation messages for filtered reservation using RSVP. **(15)**

CSE 435

7. (a) Explain the following synchronization issues with examples: (i) Content relations, (ii) Spatial relations and (iii) Temporal relations. **(8)**

(b) Write short notes on Lip synchronization explaining the followings: (i) Synchronization requirement for different views, (ii) Synchronization error detecting capability observed in experiments (iii) Different regions in error detecting graph. **(12)**

(c) Describe hierarchical and Petri net technique for specifying synchronization with advantages and disadvantages. Consider a computer based MCQ examination system. Each question has the following sequences: **(15)**

(1) A video is played with an audio in playback.

(2) A question is presented in the form of a presentation slide with audio in the background in the beginning of the presentation.

(3) The next part of the presentation will wait for a keyboard input for an indefinite period of time. The user gives the answer through this keyboard input.

(4) The result will be shown through an animation as the actual answer will be highlighted.

(5) The overall score achieved so far will be shown in a slide.

Draw the synchronization specification for the examination system using the above mentioned specific technique.

8. (a) Give the definition of QoS in different layers with examples. **(8)**

(b) What do you mean by resource in the context of multimedia applications? Describe the resource management architecture for multimedia communication system. Discuss the data structure for resource manager for call admission and reservation. **(12)**

(c) Consider three different media databases as follows: **(15)**

(1) DB1: Video database using uniform representation

(2) DB2: A legacy audio database

(3) DB3: A proprietary image database

Consider a character known as the "Big Splender". You need to find all people who are either seen with "Big Splender" in DB1 or DB3, or, heard talking to "Big Splender" in DB2. Assuming necessary functions for the legacy and proprietary databases, write down hybrid SQL statements using two different alternatives, namely, Union operations and Join operations.
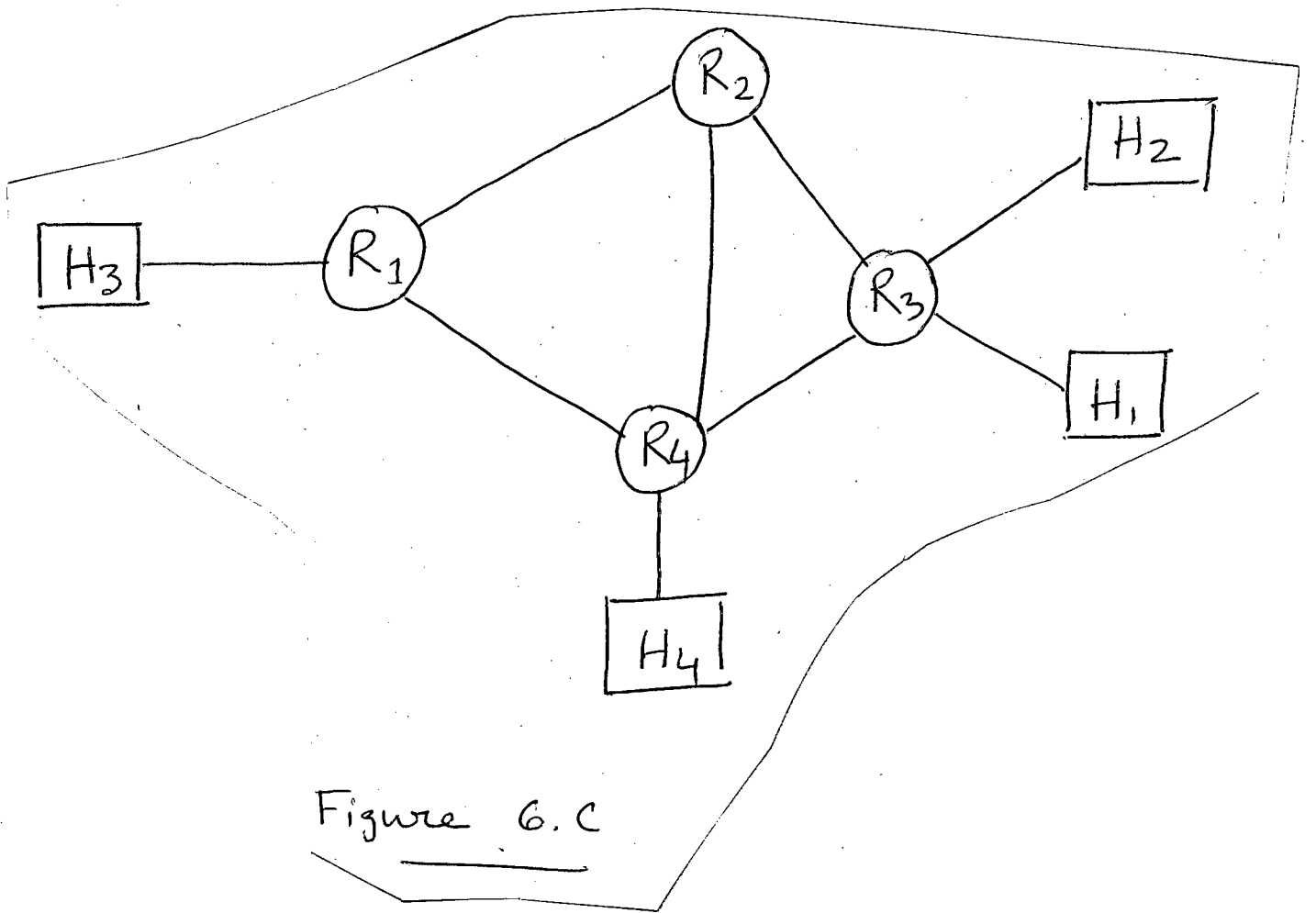

Figure 6.C

L-4/T-1/CSE Date : 22/02/2012

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **CSE 433** (Digital Image Processing)

Full Marks: 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

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SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Starting with an image formation model, derive the mathematical expressions for homomorphic filtering. Explain the cases when it is necessary. Give an example of homomorphic filtering. **(17)**

    (b) Explain an efficient implementation of fast Fourier transform. Find its complexity. **(18)**

2. (a) Explain the principle of Computerized Tomography. What is its major difference from Positron Emission Tomography? **(10)**

    (b) Describe a technique for shape coding. **(10)**

    (c) 'Convolution of a function using a unit impulse function copies the first function at the impulse location.' Justify the statement using 1D discrete functions. **(15)**

3. (a) Describe the two major steps of image digitization process. How are they related to spatial and gray level resolutions? **(20)**

    (b) State the steps of frequency domain filtering. Why do we need the centering of Fourier transform of an image? **(15)**

4. Given the normalization matrix in **Fig. 4(a)**, find the JPEG compressed representation of the 8 × 8 image block whose DCT coefficients are given in **Fig. 4(b)**. Assume the DC coefficient of the previous image block is – 17. Use the tables (**Table 4(c-e)**) attached to the question paper. **(35)**

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Why is image enhancement used? What are the broad categories of image enhancement? Discuss them. **(10)**

    (b) What is gamma correction of an image? Discuss. **(10)**

    (c) Narrate 'bit-plane slicing' approach of image enhancement. **(15)**

6. (a) Discuss what makes histogram a popular tool for real-time image processing. **(10)**

    (b) State the advantages of averaging noisy images in image enhancement and prove it. **(13)**

    (c) Derive and explain Laplacian-based image enhancement method. **(12)**

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7. (a) (i) What is image segmentation? **(2)**

(ii) On which properties of image are the image segmentation algorithms based? **(1)**

(iii) Name the categories of image segmentation algorithms and describe them. **(1+6=7)**

(b) There is a line in an image. Describe how you will determine its orientation. **(13)**

(c) Derive and discuss a mask to detect diagonal edges. **(12)**

8. (a) Discuss how global thresholding can be used in image segmentation. How can the problems of global thresholding be overcome? **(13)**

(b) Describe region splitting and merging technique for image segmentation. **(10)**

(c) Narrate how motion can be used in image segmentation. **(12)**

16	11	10	16	24	40	51	61
12	12	14	19	26	58	60	55
14	13	16	24	40	57	69	56
14	17	22	29	51	87	80	62
18	22	37	56	68	109	103	77
24	35	55	64	81	104	113	92
49	64	78	87	103	121	120	101
72	92	95	98	112	100	103	99

Fig. 4(a)

-336	35	82	3	5	8	10	12
2	2	3	4	29	12	12	11
3	3	3	26	8	11	14	11
3	3	4	6	10	17	16	12
4	4	7	11	14	22	21	15
5	7	11	13	16	21	23	18
10	13	16	17	21	24	24	20
14	18	19	20	22	20	21	20

Fig. 4(b)

Table 4(c): JPEG Coefficient Coding Categories		
Range	DC Difference Category	AC Category
0	0	N/A
−1, 1	1	1
−3, −2, 2, 3	2	2
−7,..., −4, 4,..., 7	3	3
−15,..., −8, 8,..., 15	4	4
−31,..., −16, 16,..., 31	5	5
−63,..., −32, 32,..., 63	6	6
−127,..., −64, 64,..., 127	7	7
−255,..., −128, 128,..., 255	8	8
−511,..., −256, 256,..., 511	9	9
−1023,..., −512, 512,..., 1023	A	A
−2047,..., −1024, 1024,..., 2047	B	B
−4095,..., −2048, 2048,..., 4095	C	C
−8191,..., −4096, 4096,..., 8191	D	D
−16383,..., −8192, 8192,..., 16383	E	E
−32767,..., −16384, 16384,..., 32767	F	N/A

Table 4(d): JPEG Default DC code (luminance)

Category	Base Code	Length	Category	Base Code	Length
0	010	3	6	1110	10
1	011	4	7	11110	12
2	100	5	8	111110	14
3	00	5	9	1111110	16
4	101	7	A	11111110	18
5	110	8	B	111111110	20

Table 4(e): JPEG Default AC code (luminance)
(*continues on next page*)

Run/Category	Base Code	Length	Run/Category	Base Code	Length
0/0	1010 (= EOB)	4			
0/1	00	3	8/1	11111010	9
0/2	01	4	8/2	111111111000000	17
0/3	100	6	8/3	1111111110110111	19
0/4	1011	8	8/4	1111111110111000	20
0/5	11010	10	8/5	1111111110111001	21
0/6	111000	12	8/6	1111111110111010	22
0/7	1111000	14	8/7	1111111110111011	23
0/8	1111110110	18	8/8	1111111110111100	24
0/9	1111111110000010	25	8/9	1111111110111101	25
0/A	1111111110000011	26	8/A	1111111110111110	26
1/1	1100	5	9/1	111111000	10
1/2	111001	8	9/2	1111111110111111	18
1/3	1111001	10	9/3	1111111111000000	19
1/4	111110110	13	9/4	1111111111000001	20
1/5	11111110110	16	9/5	1111111111000010	21
1/6	1111111110000100	22	9/6	1111111111000011	22
1/7	1111111110000101	23	9/7	1111111111000100	23
1/8	1111111110000110	24	9/8	1111111111000101	24
1/9	1111111110000111	25	9/9	1111111111000110	25
1/A	1111111110001000	26	9/A	1111111111000111	26
2/1	11011	6	A/1	111111001	10
2/2	11111000	10	A/2	1111111111001000	18
2/3	1111110111	13	A/3	1111111111001001	19
2/4	1111111110001001	20	A/4	1111111111001010	20
2/5	1111111110001010	21	A/5	1111111111001011	21
2/6	1111111110001011	22	A/6	1111111111001100	22
2/7	1111111110001100	23	A/7	1111111111001101	23
2/8	1111111110001101	24	A/8	1111111111001110	24
2/9	1111111110001110	25	A/9	1111111111001111	25
2/A	1111111110001111	26	A/A	1111111111010000	26
3/1	111010	7	B/1	111111010	10
3/2	111110111	11	B/2	1111111111010001	18
3/3	11111110111	14	B/3	1111111111010010	19
3/4	1111111110010000	20	B/4	1111111111010011	20
3/5	1111111110010001	21	B/5	1111111111010100	21
3/6	1111111110010010	22	B/6	1111111111010101	22
3/7	1111111110010011	23	B/7	1111111111010110	23
3/8	1111111110010100	24	B/8	1111111111010111	24
3/9	1111111110010101	25	B/9	1111111111011000	25
3/A	1111111110010110	26	B/A	1111111111011001	26
4/1	111011	7	C/1	1111111010	11
4/2	1111111000	12	C/2	1111111111011010	18
4/3	1111111110010111	19	C/3	1111111111011011	19
4/4	1111111110011000	20	C/4	1111111111011100	20
4/5	1111111110011001	21	C/5	1111111111011101	21
4/6	1111111110011010	22	C/6	1111111111011110	22
4/7	1111111110011011	23	C/7	1111111111011111	23
4/8	1111111110011100	24	C/8	1111111111100000	24
4/9	1111111110011101	25	C/9	1111111111100001	25
4/A	1111111110011110	26	C/A	1111111111100010	26

Table 4(e): JPEG Default AC code (luminance)
(*continued*)

Run/Category	Base Code	Length	Run/Category	Base Code	Length
5/1	1111010	8	D/1	11111111010	12
5/2	1111111001	12	D/2	1111111111100011	18
5/3	1111111110011111	19	D/3	1111111111100100	19
5/4	1111111110100000	20	D/4	1111111111100101	20
5/5	1111111110100001	21	D/5	1111111111100110	21
5/6	1111111110100010	22	D/6	1111111111100111	22
5/7	1111111110100011	23	D/7	1111111111101000	23
5/8	1111111110100100	24	D/8	1111111111101001	24
5/9	1111111110100101	25	D/9	1111111111101010	25
5/A	1111111110100110	26	D/A	1111111111101011	26
6/1	1111011	8	E/1	111111110110	13
6/2	11111111000	13	E/2	1111111111101100	18
6/3	1111111110100111	19	E/3	1111111111101101	19
6/4	1111111110101000	20	E/4	1111111111101110	20
6/5	1111111110101001	21	E/5	1111111111101111	21
6/6	1111111110101010	22	E/6	1111111111110000	22
6/7	1111111110101011	23	E/7	1111111111110001	23
6/8	1111111110101100	24	E/8	1111111111110010	24
6/9	1111111110101101	25	E/9	1111111111110011	25
6/A	1111111110101110	26	E/A	1111111111110100	26
7/1	11111001	9	**F/0**	**111111110111**	**12**
7/2	11111111001	13	F/1	1111111111110101	17
7/3	1111111110101111	19	F/2	1111111111110110	18
7/4	1111111110110000	20	F/3	1111111111110111	19
7/5	1111111110110001	21	F/4	1111111111111000	20
7/6	1111111110110010	22	F/5	1111111111111001	21
7/7	1111111110110011	23	F/6	1111111111111010	22
7/8	1111111110110100	24	F/7	1111111111111011	23
7/9	1111111110110101	25	F/8	1111111111111100	24
7/A	1111111110110110	26	F/9	1111111111111101	25
			F/A	1111111111111110	26

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2010-2011

Sub : **CSE 421** (Basic Graph Theory)

Full Marks: 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Define (i) outerplanar graphs, (ii) interval graphs and (iii) chordal graphs with illustrative examples. **(12)**

    (b) Briefly describe the ideal of an algorithm to recognize an outerplanar graph. **(8)**

    (c) Let G be a simple Hamiltonian graph. Then show that for each $S \subseteq V(G)$, the number of components of $G - S$ is at most $|S|$. **(5)**

    (d) Define straight-line drawing of a planar graph. Show that every planar graph has a straight line drawing. **(10)**

2. (a) What do you mean by a perfect matching in a graph? Count the number of perfect matchings in $K_{3,3}$ and in K_n. **(12)**

    (b) Let G be a bipartite graph. Then show that the maximum size of a matching in G equals the minimum size of a vertex cover. **(13)**

    (c) Let G be a graph without isolated vertices. Then show that $\alpha'(G) + \beta'(G) = n(G)$, where $\alpha'(G)$ is the maximum size of matching in G, $\beta'(G)$ is the minimum size of edge cover in G and $n(G)$ is the number of vertices in G. **(10)**

3. (a) Prove that $K_{3,3}$ is non-planar. **(7)**

    (b) Let G be a connected plane graph of n (≥ 3) vertices, m edges and f faces. Then show that $n - m + f = 2$. **(7)**

    (c) Show that $m \leq 2n - 4$ for a planar bipartite graph of n vertices and m edges. **(7)**

    (d) Define the thickness of a graph. Derive a lower bound on the thickness of a graph. **(7)**

   (e) Suppose G is a maximal planar graph. Prove that the dual graph G* of G is a cubic graph. **(7)**

4. (a) Describe two applications of graph colorings. **(8)**

    (b) Describe the vertex coloring problem with an illustrative example. **(5)**

    (c) Show that every simple planar graph is five colorable. **(10)**

    (d) Let G be bipartite graph with the maximum degree Δ. Then show that $\chi'(G) = \Delta$, where $\chi'(G)$ is the chromatic index of G. **(12)**

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SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.
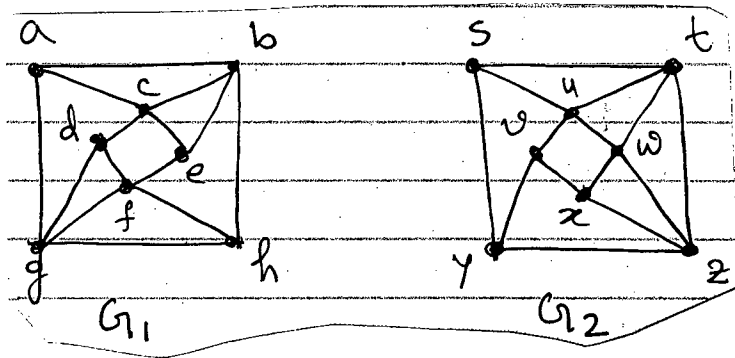
5. (a) **(5)**
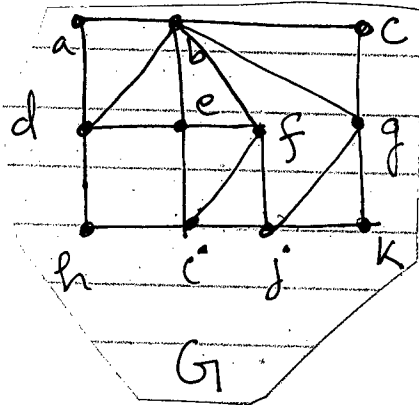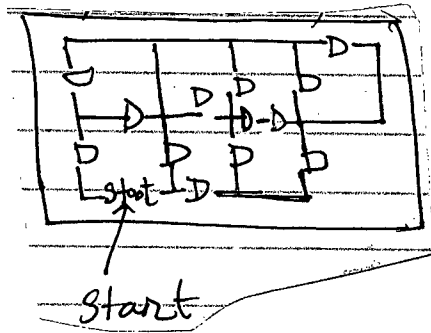

Find an Eulerian circuit for the graph G.

(b) **(6)**

Are G_1 and G_2 isomorphic? If they, show the mapping.

(c) Pam starts to visit seven rooms and the surrounding corridor without passing through any door more than once. Can she reach her goal? (D for door). Give the incidence matrix for the corresponding graph. **(8+4=12)**

(d) Prove or disprove that Peterson graph is bipartite. Is a tree a bipartite graph? If "yes", why? **(6+2=8)**

(e) For a simple undirected graph G(V, E), show that $2m \leq n^2 - n$, where $n = |V|$ and $m = |E|$. **(4)**

6. (a) What is a "graceful labeling" of a graph? Find a graceful labeling of the following tree T. **(3+3=6)**
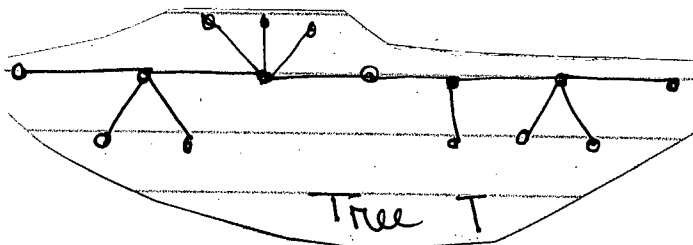
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Contd ... Q. No. 6

(b) Let G be a simple graph on n vertices if G has k components, then the number m of edges of G, satisfies **(15)**

$$n - k \leq m \leq (n - k)(n - k + 1)/2$$

(c) Define an ear decomposition of a graph G. Show that every 2-connected graph has an ear-decomposition. **(12)**

(d) What are the differences between "cut vertex" and "cut edge"? **(2)**

7. (a) What is a self-complementary graph? Draw the following graphs and their complements. Also determine whether they are self-complementary or not– **(2+3×3=11)**

    (i) C_5, (ii) Bowtie, (iii) Dart

(b) Define the following with examples. **(4+4=8)**

    (i) Union of two graphs G and H

    (ii) Contraction of an edge.

(c) (i) What is a Semi – Eulerian graph? **(3)**

    (ii) Draw a subdivision of K_5. **(3)**

(d) For an n-vertex graph G (with $n \geq 1$), prove that, G is connected and acyclic if and only if G contains no loops and has, for each $u, v \in V(G)$, exactly one $u - v$ path. **(10)**

8. (a) Define "degree sequence" and "graphic sequence". Find the minimum value of x for which the sequence $(6, 5, x, 2, 2, 2, 1, 1)$ becomes a graphic sequence. Also construct a simple graph with that sequence. **(3+5+5=13)**

(b) Let G and H be two simple graphs with vertex set V. Prove that, for every $v \in V$, $d_G(v) = d_H(v)$ if and only if there is a sequence of 2-switches that transforms G into H. **(12)**

(c) Define "symmetric difference" of two graphs G and H. Show that, every component of the symmetric difference of two matching is a path or an even cycle. **(2+8=10)**