Total No. of pages. 03
SEVENTH SEMESTER

Roll No. MC/05
B.TECH (MC)

END SEM EXAMINATION

NOVEMBER 2018

MC 405 GRAPH THEORY

Time: 3 Hours

Max.Marks: 40

Note: Answer **ALL** by selecting any two parts from each. All questions carry equal marks.

Q1(a) For a simple graph with n vertices, what is the minimum number of edges required to ensure that the graph is connected.

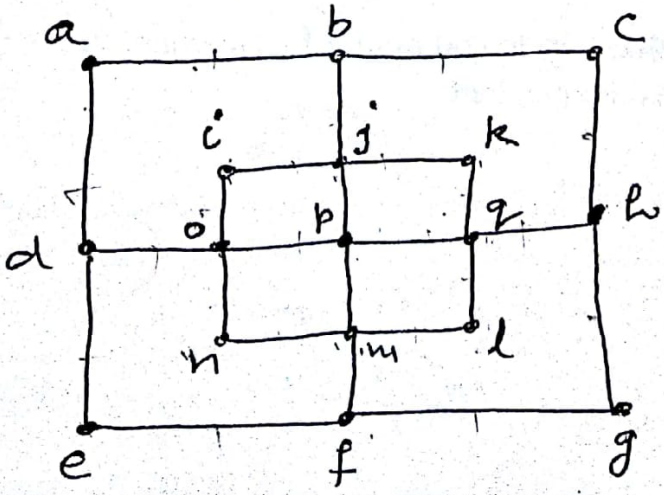
(b) Let G be a graph and $\bar{G}$ its complement. Prove or disprove the following statements:

i. If G is connected then $\bar{G}$ is connected.
ii. If G is connected then $\bar{G}$ is disconnected.
iii. If G is disconnected then $\bar{G}$ is connected.
iv. If G is disconnected then $\bar{G}$ is disconnected.

(c) A simple graph has n vertices and exactly (n-1) edges. Prove that either there is an isolated vertex or at least one vertex of degree 1.

Q2(a). How many nonisomorphic simple graphs are there with 5 vertices and 3 edges? Draw each of these graphs.

(b) Does the graph below have a Hamiltonion path? If so, find such a path. If it does not, give an argument to justify your answer.



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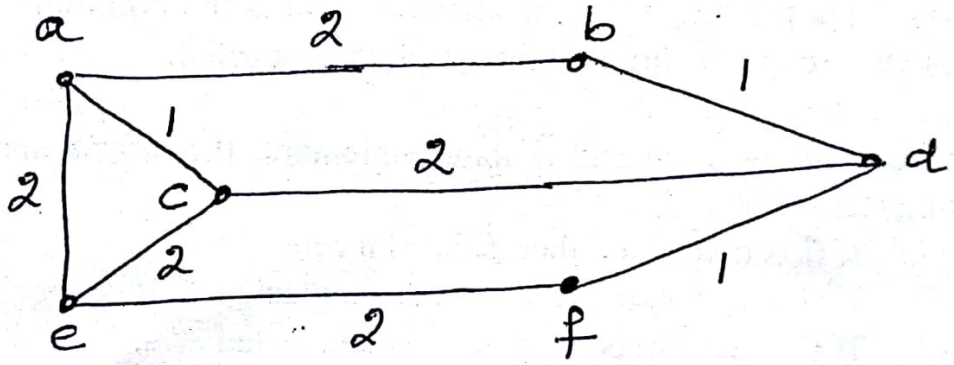
(c) Prove that a connected graph G is an Euler graph iff it can be decomposed into circuits.

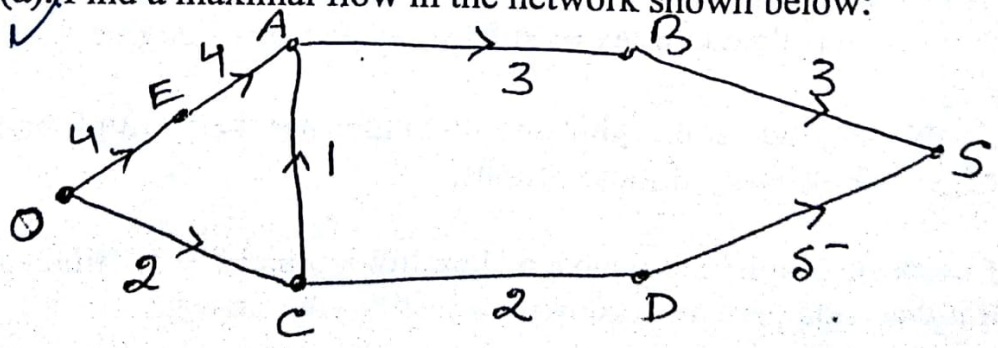
Q3(a) Prove that a tree with more than one vertex has at least two leaves.

(b) Suppose that a tree has two vertices of degree 2, four vertices of degree 3 and three vertices of degree 4. Find the number of pendant vertices in the tree.

(c) Find two distinct minimal spanning tree for the weighted graph given below:



Q4(a). Find a maximal flow in the network shown below:



(b) Suppose that v is an end point of a cut edge. Prove that v is a cut vertex iff v is not pendant.

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(c) Prove that each cut set of a given connected graph G has at least one branch of each spanning tree of G.

Q5(a) Let G be a connected graph, every vertex is of degree 2. If G has even number of vertices, prove that it has perfect matching.

(b) Consider the examination schedule problem as given in the table. By using the concept of colouring, how many examination slots are required?

Student	Subject
x_1	s_1
x_1	s_2
x_2	s_2
x_2	s_3
x_2	s_4

(c) Define Matching in a graph. Let a(n) denotes the number of perfect matching in a complete graph with even number of vertices. Find a recurrence relation for a(n) and hence solve.

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SEVENTH SEMESTER **B.TECH. [MCE]**

END SEMESTER EXAMINATION **NOVEMBER-2018**

MC-409 MATHEMATICAL MODELING AND SIMULATIONS

Time: 3: 00 hours ***Max. Marks: 40***

Note: 1. Attempt any five questions.
2. Assume missing data, if any.
3. All questions carry equal marks.

1. Discuss the following:

[a] Quantitative approach of modeling.

[b] Conceptual model.

[c] Distributed model.

[d] Lumped model.

2. [a] Develop and explain a model for diffusion of glucose or medicine in the blood stream.

[b] Discuss the model for logistic growth of bacteria population.

3. [a] A battle is modelled by

$$x' = -4y, x(0) = 150$$

$$y' = -x, y(0) = 90$$

i) Write the solution in parametric form.
ii) Who wins and when? State the loses at each side.

[b] Show that the model represented by

$$\frac{dx}{dt} = x(4 - x - y), \frac{dy}{dt} = y(15 - 5x - 3y), x, y \geq 0$$

has a position of equilibrium, this position is stable and two species can coexist.

4. [a] Develop and explain the susceptible – infected – recovered model for disease transmission.

[b] Find all equilibrium solutions of the system of differential equations

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$$\frac{dx}{dt} = 1 - xy, \frac{dy}{dt} = x - y^3$$

and determine (if possible) whether they are stable or unstable.

5. [a] Obtain the cubic spline approximation for the function defined by the data

x	0	1	2	3
$f(x)$	1	2	33	244

with $f''(0) = 0, f''(3) = 0$. Hence find an estimate of $f(2.5)$.

[b] Estimate the value of π using Monte Carlo method.

6. Discuss the long term behavior of linear and nonlinear prey – predator model.

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Total No. of Pages: 2
7th Semester
End Sem Examination

Roll No... MC105 ....
B.Tech. (MC)
(November 2018)

MC407: Cryptography and Network Security

Duration: 3 Hours **Maximum Marks: 50**

Instructions:
- *First question is compulsory. Attempt any four from rest of the questions.*
- *Calculator is allowed.*
- *Assume missing data suitably (if any).*

1. **(a)** How many one-to-one affine Caesar ciphers are there? [2]
   (b) What is a product cipher? [2]
   (c) Briefly define a field. [2]
   (d) What is a dual signature and what is its purpose? [2]
   (e) What problem was Kerberos designed to address? [2]

2. **(a)** Which parameters and design choices determine the actual algorithm of a Feistel cipher? [5]
   (b) Following ciphertext has been obtained using a Shift cipher.
   "XLILSYWIMWRSAJSVWEPIJSVJSYVQMPPMSRHSPPEVWMXMW ASVXLQSVILYVVCEIJSVIXLIWIPPIVVIGIMZIWQSVISJJIVW".
   Decrypt it using a statistical attack. [5]

3. **(a)** What is RSA algorithm. Describe encryption and decryption using RSA algorithm with an example. [5]
   (b) Describe Pretty Good Privacy in detail. [5]

4. **(a)** Explain authentication functions in detail. [5]
   (b) List and define the parameters that define an SSL session connect. [5]

5. **(a)** What is kerberos? How it provides authentication service? [5]
   (b) Consider the elliptic curve $y^2 = x^3 + x + 1$ over $\mathbb{Z}_{23}$. Let $P = (3,10)$ and $Q = (9,7)$. Find $P + Q$ and $2P$. [5]

6. **(a)** Why does ESP include a padding field? [5]

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(b) Explain digital signature algorithm. **[5]**

~All the best~

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SEVEN SEMESTER

Roll No. .....

B.Tech.

END SEMESTER EXAMINATION ***NOV/DEC-2018***

SE417 Data Warehousing and Data Mining

Time: 3:00 Hours ***Max. Marks: 40***

Note: Answer **FIVE** questions. Question No. 1 is compulsory. Assume suitable missing data, if any.

1. Attempt any 4: (3*4=12)

[a] What is Fact Table?

[b] What are Junk Dimensions?

[c] How is prediction different from classification?

[d] State the Support and Confidence measures with formulas.

[e] What do you mean by Slicing and Dicing? Give examples.

2.[a] What are the major features of snow flake schema? What is fact constellation?

[b] Explain several components of Data warehouse architecture with neat diagram. (3+4)

3.[a] What is multidimensional data model? Explain.

[b] Explain various Data pre-processing techniques. How does data reduction helps in data pre-processing. (3+4)

4. [a] Compute the entropy and purity for the confusion matrix in the following table:

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Cluster	Entertainment	Financial	Foreign	Metro	National	Sports	Total
C#1	1	1	0	11	4	676	693
C#2	27	89	333	827	253	33	1562
C#3	326	465	8	105	16	29	949
Total	354	555	341	943	273	738	3204

[b] Describe Fully Addictive, Semi-Addictive and Non-Addictive Measures with example. (3+4)

5. [a] Compare and contrast K-means and DBSCAN.

[b] State K-means algorithm. Apply k-means algorithm with two iterations to form two clusters by taking the initial cluster centers as subjects 1 and 4. (3+4)

Subject	A	B
1	1.0	1.0
2	1.5	2.0
3	3.0	4.0
4	5.0	7.0
5	3.5	5.0
6	4.5	5.0
7	3.5	4.5

6. What are the principles of APRIORI algorithms? Illustrate working of A-priori algorithm for the following dataset.

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Transaction ID	Items
T001	milk, dal, sugar, bread
T002	Dal, sugar, wheat, jam
T003	Milk, bread, curd, paneer
T004	Wheat, paneer, dal, sugar
T005	Milk, paneer, bread
T006	Wheat, dal, paneer, bread

Can we design a method that mines the complete set of frequent item sets without candidate generation? If yes, explain with example table mentioned above. (7)

7. Considering the following data, it presents Fictional data set that describes the weather conditions for playing some unspecified game. Classification problem is to predict whether the game will be played or not. Using ID3 algorithms, draw Decision tree classifier.

Day	Outlook	Temperature	Humidity.	Wind	Play Golf
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

(7)

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