Mahindra École Centrale
COLLEGE OF ENGINEERING

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

Mahindra École Centrale

MINOR–I

Program: B. Tech. **Branch: CSE** **Year: 3rd** **Semester: II**

Subject: Computer Networks (CS 310)

Date:06-02-2019 **Start Time:10.00 AM**

Time Duration: 1.5 Hours **Max. Marks: 100**

Instructions:

1. Write neatly and legibly. Marks will be deducted for shoddily presented scripts.
2. Keep answers simple and precise. If in doubt, make reasonable assumptions and state them. Show the calculations properly for numerical problems.
3. Strictly answer all parts of a question at the same place.
4. No questions will be answered during the exam.

Q.1. [20 Marks] FDM and TDM are techniques to share a link among multiple users. Explain each of these techniques. Given two application scenarios: Whatsapp voice calls and ICICI Bank transactions, explain which multiplexing technique suits which application scenario with justification.

Q.2. [15 Marks] Calculate the time taken to transmit a file of size 128000 bits over a link with transmission rate of 176Mbps. Assume that there are 10 other transmissions sharing this link, which is using TDM.

Q3. [15 Marks] Consider the following communication scenarios:

a. P2P file exchange in LAN
b. Voice-over-IP call, i.e., Skype, between two users in Singapore and West Indies
c. Email exchange between the mail servers of gmail.com and yahoomail.com

Explain which type of delays will play an important role in each of these settings with justification

Q4. [15 Marks] Under certain network conditions packet loss is more tolerable than queuing delay. Describe a scenario where queuing delay dominates packet loss and justify this statement.

Q5. [15 Marks] (a) Suppose 100 packets arrive simultaneously to a link at which no packets are currently being transmitted or queued. Each packet is of length 1500 bits and the link has transmission rate 10 Kbps. What is the average queuing delay for the 100 packets?

(b) Now suppose that 100 such packets arrive to the link every 15 seconds. What is the average queuing delay of a packet?

Q6. [20 Marks] Suppose there is a 10Mbits/s microwave link between a geostationary satellite and its base station on Earth. Every 30 seconds the satellite takes a digital photo and sends it to the base station. The base station transmits these photos across a 1Gbits/s optical fiber link leading to a Tier-1 ISP router. Assume the light propagation speed of $2*10^8$meters/sec from geostationary satellite to Earth. Distance of geostationary satellite from Earth is 36000Km.

a. What is the propagation delay, Dprop of the microwave link?
b. Let X denote the size of the photo. What is the minimum value of X for the microwave link to be continuously transmitting?

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MINOR–II
Program: B. Tech. Branch: CSE Year: III Semester: 2
Subject: Software Engineering (CS 312)

Date: March 14th, 2019 **Start Time: 10:00AM**
Time Duration: 90 Minutes **Max. Marks: 60**

Instructions:

1) *Please leave both sides of 1st page blank and start writing answers from the 3rd page.*
2) *This paper has 4 questions in all.*
3) *Answer all questions.*
4) *In each case provide most suitable answer.*

Q.1. (Marks:15).

A popular ecommerce company has approached you to build an IT solution for their web based customers. The company provides you with the following story.
User Story: "We want to reduce the amount of time our customers browse on our website before they make a decision to purchase what they need. For this we would like to greatly enhance the way our customers get to know about the range of products we have that meet their requirements"

Now devise a solution for this user story and capture it in the following use case template. HINT: Solution could be based around a recommender system, but the use case should focus on the customer sees the solution rather than how algorithm works.

Use Case Name	
Trigger	
Pre condition	
Basic Path	1. 2. 3. ....
Alternative Paths	
Post condition	
Exception Paths	
Other	

Q.2. (Marks:20).

Draw a UML Class Diagram representing the following elements from t
problem domain for a football tournament. The tournament is made up of
least six teams. Each team is composed of 11 players, and one player captai
the team. A team has a name and a record. Players have a number and
position. Football teams play games against each other. Each game has
score and a location. Teams are sometimes lead by a coach. A coach has
level of accreditation and a number of years of experience, and can coac
multiple teams. Coaches and players are people, and people have names a
addresses. Draw a class diagram for this information, and be sure to label
associations with appropriate multiplicities.

Q.3. (Marks:15).

For each of the following relationships identify the conditions under which
should be used and give an example of the relationship. Use UML cla
diagrams to depict the examples.

a) Inheritance
b) Aggregation
c) Composition
d) Dependency

Q.4. (Marks:10).

Explain Observer design pattern with the help of UML class diagram.

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Minor Examination - I

Program: B. Tech **Branch: Computer Science and Engineering** **Year: III** **Semester: 2**
Subject: Software Engineering (CS 312)

Date: 07-02-2019 **Start Time: 10:00 AM**
Time Duration: 90 minutes **Max. Marks: 30**

Instructions:

1) This paper has 5 questions in all.
2) Answer all questions.
3) In each case provide most suitable answer.

Q.1. (Marks:06).

List and briefly explain the various stages of a software engineering process.

Q.2. (Marks:04).

What is purpose of a spike solution in XP?

Q.3. (Marks:10).

Explain in detail Scrum process. Provide all information associated with Roles ceremonies and artifacts.

Q.4. (Marks:04).

What are the differences between verification and validation in software development? Explain with an example.

Q.5. (Marks:06).

What is the purpose of prototyping? Explain how you would adopt it to design a website for a client.

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Mahindra École Centrale
MINOR–I
Program: B. Tech. Branch:CSE Year:III_ Sem II
Subject: WEB PROGRAMMING CS311

Date:06-02-2019 **Start Time:14:00**
Time Duration: 1.5 Hours **Max. Marks: 100**

Instructions:
answer all questions

Q.1. (Marks:25).

(i) List out differences between TCP Socket and UDP Socket.

(ii) What is the purpose of port number in URL

(iii) What is the role of ServerSocket
(iv) explain URL Class URLConnection Class
(v) In HTTP protocol, give structure of HTTP request and response messages

..Q.2 (Marks:25)
Create a web page with following controls

a. text box to collect user name

b. four chek boxes for items –item1 item2 item3 item4

c. a collection of 3 radio buttons labeled as Visa Mastercard Discover

Q.3 (Marks:25)

(i) Explain the typical functions performed by user-agent(browser) and server in a web environment.

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Mid-Term Examination – I

Subject: Machine Learning Systems (CS 313)

ear : III Semester : II Date: 08/02/19 Duration: 90 minutes Start Time: 10AM Max. Marks: 60

1. The following six questions have four options (a)-(d), for an answer, and only one of these four is correct. You are to write the correct option next to the question number on your answer sheet, e.g. 1.4: c. **Each correct answer will fetch +3 marks, and each incorrect answer will fetch -1 mark.** **Marks: 18**

1.1. Refer to the Back-off mechanism in TCP which we used as a simple example to illustrate interaction between two players in non-cooperative Game Theory. Let the Table below illustrate the Payoff to two players A and B, under conditions that they follow the mechanism (termed C) and deliberately bypass the mechanism (D). Note that the first element of the tuple in each cell of the table denotes payoff to A, the other to B, and each of a, b, c & d are positive numbers. Under what conditions will player A always decide to play option D and player B always C?

Player A options ↓	Player B → options	C	D
	C	-a, -a	-b, -b
	D	-c, -c	-d, -d

a) $(c < a$ AND $d < b)$ AND $(a < b$ AND $c < d)$

b) $(c < a$ OR $d < b)$ AND $(a < b$ OR $c < d)$

c) $a + d = b + c$

d) None of the above.

1.2. In the terminology of Game Theory, when we say that Agents are "self-interested", the implication is that:

a) Agents are selfish and only want to do good for themselves

b) Every Agent tries to weaken and harm every other agent

c) Both (a) and (b)

d) Every Agent works to shift the Environment towards a state that gives him (her) the highest utility according to the Agent's value system.

1.3. In Genetic Programming (GP), you create software that can synthesize new programs expressed as tree structures to serve specific functionality (purpose). You provide this desired functionality for a specific program (being synthesized) to your GP software by ...

a) providing the closed form algebraic expression that your new program is supposed to codify

b) providing many training examples of input and output data that manifest the desired functionality

c) providing a series of constraint relationships between variables that should be captured in the new program

d) severely and correctly limit your terminal set (leaves) and function set (nodes) so that the program automatically synthesizes to the desired one.

1.4. A similarity between Particle Swarm Optimization Algorithm and Differential Evolution which sets them apart from Genetic Algorithms (all Classical versions), is that

a) the mechanism of Crossover creates two new children from two parents in GA
b) Genetic Algorithms are usually performed on binary numbers
c) Selection procedure maps fitness proportions between candidates into their probability of into the next generation in GA
d) For PSO and DE, the "pressure" to explore significantly different regions of the total space off proportionately as the solutions approach the global optimum, in GA this "exploration independent of the position of a candidate in the solution space.

1.5. The classical Genetic Programming approach uses Genetic Algorithms as the baseline technique. Suppose you wish to replace this baseline technique with Differential Evolution would

a) generate a *mutant tree* from a given candidate tree by combining two randomly selected trees from the population as sub-trees of another node having the arithmetic difference operator replacing one existing node of the candidate tree with this "difference" node
b) in the mutation approach similar to that used in GA, for a given candidate tree randomly select a node and substitute the underlying sub-tree with another randomly selected candidate tree from population
c) Genetic Programming is structurally and topologically aligned with Genetic Algorithms and can be replaced with Differential Evolution Algorithms
d) specifically use the Roulette wheel technique for selection of the new generation population from the existing pool.

1.6. Suppose in Genetic Algorithms you are using Tournament Selection for filling up the candidate members one by one in the succeeding generation from the current population pool. Specifically, you are using Tournament selection not between randomly chosen pairs, but randomly chosen groups of 'n' members, and extracting the fittest one from this group of 'n'. Then, the weakest 'm' members of the population will never get selected into the next generation, where 'm' equals:

a) n b) $2n-1$ c) $n-1$ d) $n+1$.

2. Let $X = [1\ 2\ 3]$ be the input variables and $Y = [2.5\ 4\ 5.5]$ be the corresponding output variables. Write fit the model $Y = aX + b$ by optimizing the squared loss function. Determine the values of a and b using gradient descent algorithm over 5 iteration by taking the following initial values, $[a, b] = [2\ 0]$. Mark

3. Explain the intuition behind the cost function of logistic regression. Show the derivative of a cost function w.r.t. each parameter θ_i and vectorize the updation rule of gradient descent. Mark

4. Construct a decision tree for the following example. Use two-way split (not multi-way) for splitting a decision node. Use median as the threshold to categorize numerical attributes. Mark

[redacted]

5 What is overfitting? How regularization helps to avoid overfitting? Mark

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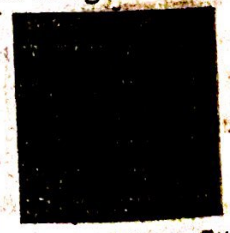
3. Explain the intuition behind the cost function of logistic regression. Show the derivation of cost function w.r.t. each parameter θ_i and vectorize the updation rule of gradient descent.

4. Construct a decision tree for the following example. Use two-way split (not multi-way split) at each decision node. Use median as the threshold to categorize numerical attributes.



5. What is overfitting? How regularization helps to avoid overfitting?

6. Explain Ada-boosting algorithm with the help of an example.

1.3 One of the requirements for training a regular feedforward ANN is to normalize the *desired outputs* in the training data so that they lie within the output range of the activation functions (either logistic or tanh) of the output neurons. Let [a, b] be the output range of such an activation function. Then, in the normalization process, you will map the domain of the desired output into a region [a+ε, b-ε], ε a small positive number, because

a) mapping exactly into [a, b] may be unsafe due to the limitations of machine (calculation) accuracy which might put certain values below or above the actual range [a, b]

b) this ε is redundant and may be set to zero

c) when the desired outputs become close to either of the bounds the derivative of the activation function – which plays a crucial role in transmitting the error upstream – becomes vanishingly small leading to inefficient training

d) the desired outputs serve as "guides" for the *predicted outputs* and pull the latter towards themselves during the training process (by modulation of weights). As the predicted outputs shift towards the desired ones, if the latter are very close to the range bounds, the derivatives of the output activation function (that generates the predicted outputs) tend towards zero, limiting the progress of training towards further reduction in error.

1.4 A ReLU function provides better training performance compared to the sigmoid functions for deep architectures because:

a) it and its derivatives are computationally faster, it automatically emulates the "dropout" mechanism for overfitting minimization, and it can be of arbitrarily large value

b) its derivatives do not "vanish" at any layer, it automatically emulates the "dropout" mechanism for overfitting minimization, and it can be of arbitrarily large value

c) it and its derivatives are computationally faster, its derivatives do not "vanish" at any layer, and it can be of arbitrarily large value

d) it and its derivatives are computationally faster, its derivatives do not "vanish" at any layer, and it automatically emulates the "dropout" mechanism for overfitting minimization.

1.5 There could be a possible natural linkage between Dropout Regularization and the ReLU activation function caused by:

a) since half the nodes with ReLU activation give output zero, it automatically damps the range of the output values

b) dropouts with say 50% probability across nodes varying randomly with presented data samples have the same effect as modulating the connectivity within a network across samples, akin to multiple network architectures all training at the same time across epochs. This annuls the possibility of a specific architecture training itself asymptotically to learn the noise specifics of the given training data, and hence implements Regularization. The ReLU activation function automatically ensures that approximately

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Minor Examination - I

Program: B. Tech Branch: ME/EEE Year: IV Semester: I
Subject: Industrial Engineering (ME415/EE498)

Date: 28-Aug-2019
Time Duration: 90 minutes

Start Time: 2:00 PM
Max. Marks: 60

Instructions:

1)Attempt any THREE QUESTIONS
2) All questions carry equal marks
3) Electronic Scientific Calculators are permitted.

(Marks 20)

Question-1

(Marks 5)

a) Discuss about different methods used for the Forecasting of industrial sale. State in few sentences about the following categories of forecasting methods:
   (i) Method used for forecasting a New Product;
   (ii) Qualitative methods;
   (iii) Time series methods.

(Marks 15)

b) A new product without any competing product of similar type was introduced in the year 2000 by a company. The sale in the year 2000 was 500 numbers. The market survey had predicted a market capacity of 20,000. Assuming, that the innovation coefficient for the product to be $p = 0.03$, and the imitation coefficient for the product to be $q = 0.4$, forecast the sale for the next ten years using the Bass Diffusion method. Consider the period of calculation to be one year.

(Marks 2

Question-2

(Marks

a) Discuss about different trends observed in the sales of products. State in few sentences about the following categories of forecasting methods:
   (i) A steadily selling product in market;
   (ii) A product which has a growth;
   (iii) A product which has changing sale every season.

(Marks 1

b) A product which exists in market over a decade has a growth in its sale. Use Exponential Smoothing method to forecast the sale of the product from the second month onwards. Assume a smoothing constant $\alpha = 0.4$. Choose the initial estimate of the forecast by Naïve method. Calculate the following:
   (i) Calculate the mean absolute value of deviation (MAD) for the last 6 months that is from July to December months.
   (ii) Forecast sale for the month of January next year.

Table of Sale Data

Month	Month number	Units sold
Jan	1	400
Feb	2	425
Mar	3	440
Apr	4	475
May	5	510
Jun	6	525
Jul	7	550
Aug	8	540
Sep	9	510
Oct	10	500
Nov	11	490
Dec	12	480

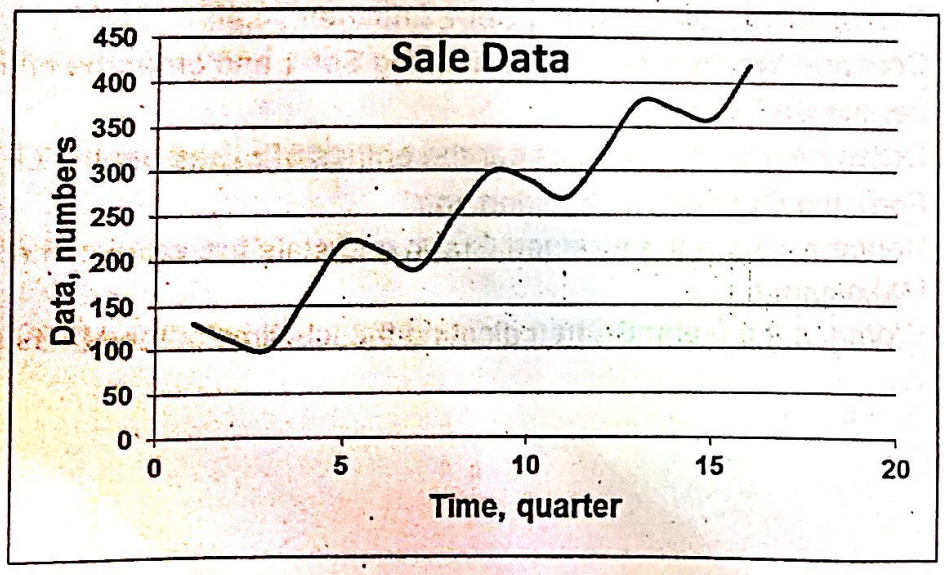
Question-3 **(Marks 20)**

A product which exists in market over a decade has a sale which varies every quarter of the year due to the effect of the seasons. Use Holt-Winter's method to forecast the sale of the product from the first quarter to the fourth quarter in the fifth year. The sale data is given in the table below. Assume the values of smoothing constant as,

$$\alpha = 0.4; \quad \beta = 0.6; \quad \gamma = 0.8;$$

Sale data:

Time	Sale Data
1	130
2	110
3	100
4	160
5	220
6	210
7	190
8	250
9	300
10	290
11	270
12	320
13	380
14	370
15	360
16	420



(Marks 20)

Question-4

(Marks 5)

a) Explain in a few sentences the following types of shops and objective:

(i) Flow shop
(ii) Job shop;
(iii) Open shop;
(iv) What is meant by Makespan.

(Marks 15)

b) A flow shop contains two machines which process the jobs in a fixed sequence. There are five jobs to be processed on the two machines. The process times of the five jobs are given below. Here p_{1j} & p_{2j} indicates the process time of j^{th} job on Machine-1 and Machine-2 respectively. Work out the optimum schedule of processing the jobs in the sequence Machine-1 and then Machine-2 for the optimum value of Makespan using Johnson's Method.

Process time p_{ij} of the Jobs j_j					
Job (j)	j_1	j_2	j_3	j_4	j_5
p_{1j}	3	4	4	6	7
p_{2j}	4	2	4	5	6

Form the following sets and state the following particulars:

(i) The Leading Set-1, Trailing Set-2 and the tie-set;
(ii) Combine the Tie-Set with the Leading Set-1 and order the entries of p_{1j} as per the SPT rule;
(iii) Order the Trailing Set-2 as per the entries of p_{2j} as per the LPT rule;
(iv) Form the Optimally Scheduled set;
(v) Hence work out the Directed Graph and state the value of the optimum Makespan C_{max};
(vi) Work out the Gantt Chart indicating the idle time of the Machine-2.