2015-16  
M.TECH. (WINTER SEMESTER) EXAMINATION  
COMPUTER ENGINEERING  
SOFTWARE ENGINEERING-II  
CO-603  

Maximum Marks: 60  
Credits: 04  
Duration: Three Hours

Answer all the questions.  
Assume suitable data if missing.  
Notations used have their usual meaning. 

<table>
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<tr>
<th>Q. No</th>
<th>Question</th>
<th>M.M.</th>
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<tbody>
<tr>
<td>1(a)</td>
<td>Write Hooker’s General Principles for Software Engineering.</td>
<td>[03]</td>
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<tr>
<td>1(b)</td>
<td>Explain the Extreme Programming method of agile software development. What is pair programming and what are its advantages?</td>
<td>[06]</td>
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<td>1(c)</td>
<td>Briefly describe the criteria for choosing agile development over plan driven approach</td>
<td>[06]</td>
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<td>1*(c)</td>
<td>List and explain phases of Scrum? Clearly describe the sprint cycle.</td>
<td>[06]</td>
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<tr>
<td>2(a)</td>
<td>What do you understand by ethnography? How is it useful in the requirements engineering process?</td>
<td>[03]</td>
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<tr>
<td>2(b)</td>
<td>Differentiate between functional and non-functional requirements and give a classification for non-functional requirements.</td>
<td>[06]</td>
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<tr>
<td>2(c)</td>
<td>What do you understand by model driven architecture? Explain.</td>
<td>[06]</td>
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<td>2*(c)</td>
<td>What do you understand by system modelling? Explain in detail.</td>
<td>[06]</td>
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<tr>
<td>3(a)</td>
<td>What is a software risk? What are its types?</td>
<td>[03]</td>
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<tr>
<td>3(b)</td>
<td>What is a baseline? Briefly explain how SCIs are baselined within a project database.</td>
<td>[06]</td>
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<tr>
<td>3(c)</td>
<td>What are the functions of an SCM repository? Explain.</td>
<td>[06]</td>
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<td>OR</td>
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<tr>
<td>3*(c)</td>
<td>What do you understand by system building? What are the steps involved in it?</td>
<td>[06]</td>
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*Contd.....2.*
4(a) What is executable UML?
4(b) Draw the sequence diagram for the 'Cash Withdrawal' feature of an ATM.
4(c) What are the steps involved in object oriented design? Discuss.

OR

4(e) Write short notes on:
   1. Generalization
   2. Refactoring
   3. Open Source software development
Q.No.  Question                                                                                     M.M.  
1(a)   Construct class diagram based upon following description – *A cinema hall offers*  [7.5]  
First Class and Executive Class tickets to its customers. It has defined show timings  
which run everyday. *Customer can give seat preference after examining seat layout*  
while booking tickets.  
1(b)   How is enumeration represented in class diagram? Explain with the help of a  [7.5]  
realistic example. Discuss whether you’ll model the following using enumeration –  
*Fan is of type Ceiling Fan, Table Fan and Exhaust Fan.*  
OR                                                                                               
1′(a)  Construct class diagram based upon following description – *Employees work for*  [7.5] 
companies either on full time basis or on part time basis. Companies also hire  
consultants to get advice. *Consultants specialise in domains such as marketing,*  
technical, training etc. *A part time employee can also work as consultant with other*  
companies. *Full time employees are not allowed to work for other companies in any*  
capacity.  
1′(b)  What is an abstract class? How is it represented in class diagram? Take realistic  [7.5]  
example to explain. List some good modelling practises that one should follow  
while using abstract and concrete classes.  
2(a)   Construct state diagram for automatic vending machine. Give complete  [7.5]  
characterisation of any ONE state in your state diagram.  

Contd.....2.
2(b) Differentiate between followings –
   i) Time Event and Change Event
   ii) Continuous Loop State Diagram and One-shot State Diagram
   iii) Guarded Transition and Completion transition

3(a) Construct sequence diagram for making call on landline phone. Consider both the normal and exceptional scenario.

3(b) What are swim lanes in activity diagram? What do lines across swim lanes represent? Take suitable example of an activity diagram to explain.

OR

3'(a) Consider a hotel reservation system whose description is as given below –
   Customer can book a room, book the package named as HOLIDAY (includes room, local sight-seeing and breakfast), book the package named as WELCOME (includes room plus pick and drop). Customer can make the payment through cash, cheque or card.
   Prepare use case diagram containing appropriate relationship between use cases.

3'(b) Construct sequence diagram for purchasing an item from automatic vending machine.

4(a) Discuss how a system can be decomposed into subsystems in terms of i) Layers ii) Partitions iii) Combination of layers and partitions. Take suitable example to explain.

4(b) Describe steps for constructing application interaction model.
Q.No  Question                                                                 MM
1(a)  What are the characteristics of wireless links? With the help of suitable diagrams describe hidden terminal and exposed terminal problems. [6]

OR

(a') With the help of suitable diagrams, describe the elements of a wireless network. What is meant by the following terms: (i) ad hoc network, and (ii) handoff?

(b) Sketch the channel outputs at the sender side and at the receiver side for Code-Division Multiple Access (CDMA) for the following two cases.
   (i) A single sender who is assigned an M-bit code (1, -1, 1, -1, 1, 1, -1), where M = 8. Assume that there are two data bits $d_0 = -1$, $d_1 = 1$ to be sent in time slots 0 and time slot 1, respectively.
   (ii) There are two sender-receiver pairs: (S1, R1) and (S2, R2). The first pair is allocated a code (1, 1, 1, -1, 1, -1, -1, 1), and the second pair is allocated a code (1, -1, 1, 1, 1, -1, 1, 1). The first sender sends two data bits $d_0 = 1$, $d_1 = -1$, and the second sender sends $d_0 = -1$, $d_1 = -1$ in time slots 0 and 1, respectively.
   Write all intermediate steps and expressions used.

[9]

2(a) With the help of suitable diagrams, describe the IEEE 802.11 MAC protocol. How does an RTS/CTS mechanism improve the performance of IEEE 802.11? [9]

OR

(a') With the help of suitable diagrams, describe direct and indirect routing to a mobile node.

Contd.....
(b) Suppose there are two ISPs providing Wi-Fi access in a particular café, with each ISP operating its own AP and having its own IP address block.

(i) Further suppose that by accident, each ISP has configured its AP to operate over channel 11. Will the 802.11 protocol completely breakdown in this situation? Discuss what happens when two stations, each associated with a different ISP, attempt to transmit at the same time.

(ii) Now suppose that one AP operates over channel 1 and other over channel 11.

3(a) With the help of suitable diagrams, describe the following schemes to reduce the effects of jitter: (i) fixed playout delay, and (ii) adaptive playout delay.

(b) Consider the adaptive playout delay scheme to estimate the network delays. Let \( d_i \) be an estimate of the average network delay upon reception of the \( i \)th packet, which is governed by the following expression.

\[
d_i = (1-u)d_{i-1} + u(r_i - t_i)
\]

where, \( t_i \) is the timestamp of the \( i \)th packet (i.e. the time the packet was generated by the sender), \( r_i \) is the time packet \( i \) is received by the receiver, and \( p_i \) is the time the packet is played at the receiver. Suppose that \( u = 0.1 \). Let \( r_1 - t_1 \) be the most recent sample delay, let \( r_2 - t_2 \) be the next most recent sample delay, and so on.

(i) For a given audio application, suppose four packets have arrived at the receiver with sample delays \( r_4 - t_4 \), \( r_3 - t_3 \), \( r_2 - t_2 \), and \( r_1 - t_1 \). Express the estimate of the delay \( d \) in terms of the four samples.

(ii) Generalize your formula for the \( n \) sample delays.

OR

(b') With the help of appropriate diagrams, describe Content Distribution Networks.

4(a) Consider two forward error correction (FEC) schemes for Internet phone. The first scheme sends a redundant encoded chunk after every \( n \) chunks. The second scheme sends a lower resolution audio stream as the redundant information. Suppose the first scheme generates a redundant chunk for every four original chunks. Suppose the second scheme uses a low-bit rate encoding whose transmission rate is 25% of the transmission rate of the nominal stream.

(i) How much additional bandwidth does each scheme require? How much playback delay does each scheme add?

(ii) How do the two schemes perform if the first packet is lost in every
group of five packets? Which scheme will have better audio quality?

(iii) How do the two schemes perform if the first packet is lost in every group of two packets? Which scheme will have better audio quality?

OR

(a') Consider an Internet phone application where the speaker generates an audio signal consisting of alternating talk spurts and silent periods. In order to conserve bandwidth, the Internet phone application generates packets only during talk spurts. During a talk spurt the sender generates bytes at a rate of 8000 bytes per second, and every 20 milli-seconds the sender gathers bytes into chunks. Let $h$ be the total number of header bytes added to each chunk, including UDP and IP headers.

(i) Assuming an IP datagram is emitted every 20 milli-seconds, find the transmission rate in bits per second for the datagrams generated by one side of this application.

(ii) What is a typical value of $h$ when RTP is used? What portion of the bandwidth is consumed by the header part when RTP is used?

(b) With the help of a suitable diagram, describe Weight Fair Queueing (WFQ). Suppose [7.5] that WFQ scheduling is applied to a buffer that supports four classes, and suppose the weights are 0.5, 0.25, 0.125, and 0.125 for the four classes.

(i) Suppose that each class has a large number of packets in the buffer. In what sequence might the four classes be served in order to achieve the WFQ weights?

(ii) What would have been the sequence for a round robin scheduling?
Answer all the questions.  
Assume suitable data if missing. 
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<tr>
<td>1</td>
<td>Attempt any three parts.</td>
<td>3*5=15</td>
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<tr>
<td>(a)</td>
<td>Discuss any five major issues related to mining methodology in data mining.</td>
<td>[5]</td>
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<tr>
<td>(b)</td>
<td>What is data cube? How concept hierarchies are used for summarization in data cube?</td>
<td>[5]</td>
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<tr>
<td>(c)</td>
<td>What is data reduction? Discuss principal component analysis (PCA) method for data reduction.</td>
<td>[5]</td>
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<tr>
<td>(d)</td>
<td>What are the disadvantages of Apriori algorithm? Discuss any three methods to improve its efficiency.</td>
<td>[5]</td>
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2 Attempt any three parts.

(a) Discuss the advantages and disadvantages of backpropagation algorithm? Explain how learning is performed by backpropagation algorithm in multilayer feed forward neural network. [5]

(b) Explain any five major issues in clustering with suitable examples. [5]

(c) State any two types of movements which are used to characterize a time series? How these movements are mined in a time-series? [5]

(d) Explain the MapReduce programming model with a suitable example? [5]

Contd.....2.
3 Attempt any two parts.
(a) What do you mean by a Web Spider? Discuss its working in detail. Give an example of an Intelligent Web Spider and mention the intelligent techniques used in it.
(b) Why Web content mining is sometimes called Web text mining? List different types of text data mining and discuss any three of them in detail.
(c) What are the problems associated with hyperlink mining? List the two popular link mining algorithms. Discuss the advantages and limitations of both the algorithms.

4 Attempt any two parts.
(a) Describe the goal of Web searching. What are the challenges for the area of Web searching? What do you mean by relevance and importance of a Web document in the Web search? How search engines rank document?
(b) Discuss in detail the keyword based approach for image mining. List the various limitations of the manual annotation?
(c) Consider the following set of documents, and compute their similarity with the query Q using Vector Space Model with TFIDF weighting, given the frequency of the occurrence of the words therein. Finally, rank the documents in order of their similarity to the query Q.

<table>
<thead>
<tr>
<th></th>
<th>Car</th>
<th>Jeep</th>
<th>Bike</th>
<th>Cat</th>
<th>Rat</th>
<th>Ant</th>
<th>Snake</th>
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2015-16
M.TECH. (WINTER SEMESTER) EXAMINATION
COMPUTER ENGINEERING
MODERN ARTIFICIAL INTELLIGENCE
CO - 621

Maximum Marks: 60   Credits: 04   Duration: Three Hours

Answer all the questions. Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.  Questions  M.M.

1(a)  What is the difference between un-informed search and informed search strategies?  [05]

1(b)  Explain with example semantic net and frame based representation. Explain how
frames are useful to express the idea of inheritance?  [10]

OR

1(b')  Design a suitable representation including production rules and derive the solution
paths in tabular form for the following AI problem:

Three missionaries and three cannibals are on one side of a river, with a canoe.
They all want to get to the other side of the river. The canoe can only hold one or
two people at a time. At no time should there be more cannibals than
missionaries on either side of the river, as this would probably result in the
missionaries being eaten.  [10]

2  Explain the following approaches to prove validity of a formula  [15]

(a) Natural Deduction System
(b) Axiomatic System
(c) Semantic Tableau method
(d) Resolution by Refutation method

OR

2'(a)  Using semantic tableau method, show that the following formula is inconsistent.  [05]

\[\alpha : (P \land Q \rightarrow R) \land (\neg P \rightarrow S) \land Q \land R \land \neg S\]

2'(b)  Using semantic tableau method, show that the following formula is consistent and
find its model.

\[\alpha : (\neg (A \lor B) \land (B \rightarrow C) \land (A \lor C))\]

2'(c)  Convert the following statements to expressions (formula) in first order logic.  [05]

1. John likes all kinds of food.
2. Apples are food.
3. Anything anyone eats and isn’t killed by is food.
4. Bill eats peanut and is still alive.
5. Sue eats everything Bill eats.

Contd.....2.
3(a) Write a Program in PROLOG to show a typical family relation. How would you pose questions to PROLOG system about family relations? [05]

3(b) Evaluate the performance of at least two different heuristics for solving 8-puzzle problem using best first search algorithm. Show the successive stages of open and closed lists. [10]

OR

3(b') Explain conceptual dependency theory. Translate the following sentences into conceptual graphs.

(a) A dog named Tommy is black.
(b) Akram gave Anil the book.
(c) The dog scratches its ear with its paw

4(a) Prove that the law of excluded middle and the law of contradiction do not hold in fuzzy logic. You may prove it through an example. [05]

4(b) Explain Non-monotonic reasoning. What is Truth Maintenance System (TMS)? [05]

4(c) Briefly describe Genetic Algorithm? What is Roulette wheel selection in Genetic Algorithm? [05]