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10IS51

Fifth Semester B.E. Degree Examination, June/July 2019
Software Engineering

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. What are the attributes of a good software? Explain. Also list and explain the key challenges facing software engineering. (07 Marks)
- b. Explain two types of emergent properties. Give examples for emergent properties. (06 Marks)
- c. Explain legacy system components with a neat diagram. (07 Marks)
- 2 a. What are critical systems? Explain different types of critical systems. Give examples to each. (06 Marks)
- b. With a neat diagram, describe the water fall model of software development process. (10 Marks)
- c. Explain the various phases of rational unified process. (04 Marks)
- 3 a. What are functional and non-functional requirements? Discuss the functional requirements in detail. (08 Marks)
- b. What are the requirements validation techniques? Explain briefly. (06 Marks)
- c. Explain the structure of the requirements document. (06 Marks)
- 4 a. Write short notes on : (i) Context model (ii) Object model. (10 Marks)
- b. Explain the risk management process with a neat sketches. Explain any one of its stage in detail. (10 Marks)

PART – B

- 5 a. With an example describe the repository model and give its advantages and disadvantages. (10 Marks)
- b. Explain two generic control styles with examples. (06 Marks)
- c. Mention and define two types of design models of object oriented design. (04 Marks)
- 6 a. What is extreme programming (XP)? Explain a number of practices involving in extreme programming (XP). (08 Marks)
- b. Discuss the principles of agile methods. (05 Marks)
- c. Explain re-engineering process with a neat diagram. (07 Marks)
- 7 a. Explain the activities in the inspection process with a neat diagram. (06 Marks)
- b. Write a short notes on :
 - (i) Integration testing.
 - (ii) Release testing.
 - (iii) Performance testing. (09 Marks)
- c. What is path testing? Draw a flow graph for a binary search routine. (05 Marks)
- 8 a. Explain factors governing staff selection. (10 Marks)
- b. Discuss in detail algorithmic cost models in project planning. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

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Fifth Semester B.E. Degree Examination, June/July 2019

Systems Software

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1
 - a. Explain SIC/XE machine instruction formats. (08 Marks)
 - b. Differentiate between CISC and RISC. (06 Marks)
 - c. Write the programs in SIC:
 - i) to copy the string 'IT SECTOR' to another string
 - ii) to perform $P1 = P2 - P3 + 3$ where P1, P2 and P3 are integers. (06 Marks)

- 2
 - a. Explain any four assembler directives of SIC/XE machine with an example for each. (06 Marks)
 - b. Explain the algorithm for pass 1 of two pass assembler. (08 Marks)
 - c. Generate the object program for the following SIC program.


```
SS START 2000
LI LDA X
   ADD Y
   STA Z
X RESW 1
Y RESW 1
Z RESW 1
END LI
```

 opcodes : LDA – 00, ADD – 18, STA - 0C (06 Marks)

- 3
 - a. Explain how literals are handled in SIC/XE. (06 Marks)
 - b. Explain the multipass assembler with an example. (08 Marks)
 - c. Explain the features of MASM assembler. (06 Marks)

- 4
 - a. Explain the processing of an object program using linking loader and linkage editors with neat diagrams. (08 Marks)
 - b. Explain the bootstrap loader for SIC/XE. (08 Marks)
 - c. Write a short note on MS-DOS linker. (04 Marks)

PART – B

- 5
 - a. Explain the structure of text editor with a neat diagram. (10 Marks)
 - b. Briefly explain the user interface criteria in a text editor. (04 Marks)
 - c. Explain the interactive debugging functions and capabilities. (06 Marks)

- 6
 - a. Write the algorithm for a one pass macroprocessor. (08 Marks)
 - b. Explain recursive macro expansion with an example. (06 Marks)
 - c. Explain the features of ANSI C macro processor. (06 Marks)

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- 7 a. Explain the different sections of a LEX program with an example. (08 Marks)
- b. Explain the use of following characters that form regular expression with an example for each.
- i) *
 - ii) ^
 - iii) { }
- (06 Marks)
- c. Write a lex program to count the number of characters, words, spaces and lines in a given input file. (06 Marks)
- 8 a. Write a YACC program to recognize the given arithmetic expression containing +, -, * and / operators. (08 Marks)
- b. Explain shift-reduce parsing with an example. (06 Marks)
- c. Discuss the following terms with an example for each:
- i) Ambiguous grammar
 - ii) Recursive rules
- (06 Marks)

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Fifth Semester B.E. Degree Examination, June/July 2019

Operating Systems

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1
 - a. Discuss the types of multiprocessor systems and the advantages of multiprocessor systems. (06 Marks)
 - b. Which calls provide an interface to the service made available by an operating system? Explain the same with suitable examples. (06 Marks)
 - c. Explain the method of operating system design which involves using object oriented programming technique with a neat diagram. (08 Marks)
- 2
 - a. List the operating system primitives that are used in direct and indirect communication between cooperating process. (04 Marks)
 - b. Name and explain the formula that is used to predict the value of the next CPU burst required for shortest job first scheduling method. (06 Marks)
 - c. Four processes P1, P2, P3 and P4 arrive in the order given below with the following CPU burst and priority values. Compute the average waiting time using:
 - i) Round Robin with time quantum = 3
 - ii) Preemptive priority scheduling (low values has high priority)
 - iii) Preemptive shortest job first scheduling.

Process	CPU burst	Arrival time	Priority
P1	8	0	5
P2	4	2	2
P3	6	1	3
P4	1	3	1

(10 Marks)

- 3
 - a. Consider two concurrently running processes P1 with statement S1 and S3 along with P2 with statements S2 and S4. The required order of execution of the statements must be S2, S4, S1 and S3. Solve this problem using semaphores. (08 Marks)
 - b. Define and explain the semaphore structure, wait operation and signal operation of a semaphore which avoids busy waiting. (06 Marks)
 - c. Discuss the importance of processor affinity and the types of processor affinity. (06 Marks)
- 4
 - a. Explain the steps involved in a resource allocation graph algorithm which is used to avoid deadlocks. (06 Marks)
 - b. Explain how the circular wait condition can be used to prevent deadlocks. (04 Marks)
 - c. Assume there are 3 processes P0 through P2 and 3 resource types each having 4 instances. The allocation and max matrix is given below:

	Allocation			Max		
	A	B	C	A	B	C
P0	2	1	2	4	1	3
P1	1	1	1	2	1	2
P2	0	1	1	1	1	1

Answer the following questions using Banker's algorithm:

- i) Is the system in safe state? If so find safe sequence.
- ii) At time t_1 , if a request from process P1 arrives for (0, 1, 0) can the request be granted? If so find the safe sequence.
- iii) At time t_2 , if a request from process P1 arrives for (1, 0, 0) can the request be granted? If so find the safe sequence. (10 Marks)

PART – B

- 5 a. Illustrate and explain Belady's anomaly using a suitable example. (06 Marks)
- b. Explain the strategy used to prevent thrashing. (06 Marks)
- c. Explain segmentation and how the physical address is generated using a neat diagram. (08 Marks)

- 6 a. List and explain the most common schemes used for defining the logical structure of a directory. (10 Marks)
- b. Discuss the four techniques used to keep track of free disk space. (10 Marks)

- 7 a. List and explain any four methods used for implementing access matrix. (10 Marks)
- b. Suppose that a disk drive has 200 cylinders numbered 0 to 199. The drive is currently serving a request at cylinder 53 and the previous request was at 43. The queue of pending requests in FIFO order is 98, 183, 37, 122, 14, 124, 65, 67. Starting from current position calculate total cylinders crossed using SCAN, CSCAN and FCFS disk scheduling algorithms. (10 Marks)

- 8 Write short notes on:
 - a. Driver registration in LINUX (07 Marks)
 - b. Kernel synchronization in LINUX (07 Marks)
 - c. Implementation of virtual machines (06 Marks)

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10CS54

Fifth Semester B.E. Degree Examination, June/July 2019
Database Management Systems

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting
at least TWO full questions from each part.**

PART – A

- 1 a. Discuss the main characteristics of the database approach and how differs from traditional file systems. (12 Marks)
- b. Discuss the different types of user-friendly interfaces and the types of users who typically use each. (08 Marks)
- 2 a. With an aid of a neat diagram, describe a simplified database design process. (08 Marks)
- b. What is an entity type? What is an entity set? Explain the differences among an entity, an entity type, and an entity set. (06 Marks)
- c. When is the concept of a weak entity used in data modeling? Define the terms owner entity type, weak entity type, identifying relationship type and partial key. (06 Marks)
- 3 a. Briefly discuss the different types of update operations on relation. (10 Marks)
- b. With an example for each, explain the purpose and notation for the following operations of relational algebra:
 - i) SELECT
 - ii) THETA JOIN
 - iii) UNION
 - iv) CARTESIAN PRODUCT
 - v) DIVISION
 (10 Marks)
- 4 Consider the following schemes:
 Sailors (Sid : integer, sname : string, rating : integer, age : real)
 Boats (bid : integer, bname : string, color : string)
 Reserves (Sid : integer, bid : integer, day : date)
 Write the following queries in SQL. No duplicate should be printed in any of the answers:
 - i) Find the Sids of sailors who have reserved a red boat. (02 Marks)
 - ii) Find the names of sailors who have reserved a red boat. (02 Marks)
 - iii) Find the colors of boats reserved by Danny. (02 Marks)
 - iv) Find the names of sailors who have reserved at least one boat. (02 Marks)
 - v) Find the names of sailors who have reserved a red or a green boat. (03 Marks)
 - vi) Find the names of sailors who have reserved both a red and a green boat. (03 Marks)
 - vii) Find the Sids of all sailors who have reserved red boats but not green boats. (03 Marks)
 - viii) Find all Sids of sailors who have a rating of 10 or reserved boat 104. (03 Marks)

PART – B

- 5 a. With illustrative example for each, discuss the following commands used to modify the database:
 INSERT
 DELETE and
 UPDATE
 (10 Marks)

- b. What are the significant issues in database programming? List and explain the three main approaches to database programming. What are the advantages and disadvantages of each approach? (10 Marks)
- 6 a. What do you mean by functional dependency? What are the possible sources of the information that defines the functional dependencies that hold among the attributes of a relation schema? Explain. (10 Marks)
- b. Discuss the purpose of Boyce-Codd normal form BCNF and describe how BCNF differs from and is stronger than 3NF. Illustrate your answer with an example. (10 Marks)
- 7 a. Write an algorithm to test the non-adaptive join property, and to determine whether functional dependencies are preserved in decomposition. (10 Marks)
- b. Define Join Dependency (JD) and fifth normal form (5NF). (05 Marks)
- c. Write short notes on the following:
- i) Template dependencies (05 Marks)
 - ii) Domain-key normal form. (05 Marks)
- 8 a. What are the ACID properties? Explain. (06 Marks)
- b. What is a precedence graph or serializability graph? How is it related to conflict serializability? How is it related to two-phase locking? (06 Marks)
- c. Explain what happens if there are crashes during the undo phase of recovery. What is the role of CLRs? What if there are crashes during the analysis and Redo phases? (08 Marks)

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Fifth Semester B.E. Degree Examination, June/July 2019
Computer Networks – I

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
atleast TWO questions from each part.**

PART – A

- 1 a. Explain with a neat diagram the TCP/IP protocol suite and different protocols used in different layers. (10 Marks)
- b. Explain different levels of addressing used in an internet employing TCP/IP protocol with example for each. (10 Marks)
- 2 a. List the factors on which data rate depends upon and describe the two formulas developed to calculate the data rate. (08 Marks)
- b. Calculate the propagation time and transmission time for a 5mB message if eth BW of the optical network is 1mbps. The distance between sender and receiver is 12000kms. (04 Marks)
- c. Represent the given sequences 01101101 using NRZ – L, NRZ – I differential Manchester, AMI and pseudo ternary line coding schemes. (08 Marks)
- 3 a. Explain FDM and synchronous TDM with an example for each. (10 Marks)
- b. Explain briefly QPSK with implementation and constellation diagram. (06 Marks)
- c. Differentiate between circuit switched, datagram network and virtual circuit networks. (04 Marks)
- 4 a. Explain the different types of errors and redundancy. (04 Marks)
- b. What is internet checksum? With an example explain the steps taken by sender and receiver to error detection. (06 Marks)
- c. Find the code word using CRC if dataword is 1010 and generator is 1011 and retrieve the dataword from codeword using decoder. (10 Marks)

PART – B

- 5 a. Explain with neat diagram, design and concept of GO BACK N ARQ protocol. (10 Marks)
- b. What is framing? Explain with diagram character oriented protocol and bit oriented protocols with example. (06 Marks)
- c. Explain the transition phase of PPP. (04 Marks)
- 6 a. Explain CSMA/CA with flow diagram. (07 Marks)
- b. Explain with neat diagram the three popular controlled access methods. (09 Marks)
- c. A pure ALOHA network transmits 200 bit frames on a shared channel of 200kbps. What is the through put if the system produces i) 1000 frames/sec ii) 500 frames/sec. (04 Marks)
- 7 a. Explain hidden and exposed station problems in IEEE 802.11. (06 Marks)
- b. Explain with neat diagram the three major systems of second generation cellular phone system. (08 Marks)
- c. Explain repeaters, bridges and routers and the differences between them. (06 Marks)
- 8 a. Explain in detail the IPV6 packet format with its extension headers. (10 Marks)
- b. Give the comparison between IPV6 and IPV4. (05 Marks)
- c. Write notes on piconet and scatternet Bluetooth network. (05 Marks)

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Fifth Semester B.E. Degree Examination, June/July 2019
Formal Languages and Automata Theory

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, selecting at least TWO full questions from each part.

PART – A

- 1 a. Briefly discuss why study automata theory. (06 Marks)
 b. Design a DFA to accept strings over {a, b} that contain the substring bb or do not contain the substring aa. (05 Marks)
 c. Design a DFA to accept set of strings over {0, 1} in which the number of 0's is divisible by three and 1's is divisible by two. (05 Marks)
 d. Explain the procedure subset construction for converting NFA to an equivalent DFA. (04 Marks)

- 2 a. Define ϵ -NFA. Consider the following ϵ -NFA :

δ	ϵ	θ	1	2
$\rightarrow q_0$	{q ₁ }	{q ₀ }	ϕ	ϕ
q ₁	{q ₂ }	ϕ	{q ₁ }	ϕ
*q ₂	ϕ	ϕ	ϕ	{q ₂ }

- i) Compute the ϵ -closure of each state.
 ii) Convert the automaton to a DFA. (10 Marks)
- b. Define regular expression. Convert the following DFA to a regular expression, using the state elimination technique:

δ	0	1
$\rightarrow *p$	s	p
q	p	s
r	r	q
s	q	r

- 3 a. State and prove pumping lemma for regular languages. (05 Marks)
 b. Prove that the language $L = \{0^n \mid n \geq 0\}$ is not regular. (05 Marks)
 c. Prove the following with examples:

- i) If L and M are regular languages, then so is $L \cap M$.
 ii) If L is a regular language, so is L^b . (10 Marks)

- 4 a. Define context-free grammar. Design CFG's for the following languages:

- i) $L = \{0^i 1^j \mid i \neq j\}$ ii) $L = \{x \mid n_0(x) \neq n_1(x)\}$ (10 Marks)

- b. What is an ambiguous grammar? Show that the following grammar is ambiguous.

$$S \rightarrow aSb \mid aAb$$

$$A \rightarrow cAd \mid B$$

$$B \rightarrow aBb \mid \epsilon$$

(05 Marks)

- c. Define inherently ambiguous. With suitable example, show that the CFL is inherently ambiguous. (05 Marks)

PART – B

- 5 a. Define pushdown automata. Define a PDA to accept the language.
 $L = \{wxw^R \mid w \text{ is in } \{0,1\}^* \text{ and } x \text{ is in } \{0,1,\varepsilon\}\}$. (10 Marks)
- b. What conditions are to be met for a PDA to be deterministic? Convert the PDA $P = (\{q_0, q_1\}, \{0,1\}, \{X, Z_0\}, \delta, q_0, Z_0)$ to a CFG, if δ is given by :
- $\delta(q_0, 0, Z_0) = \{(q_0, XZ_0)\}$
 - $\delta(q_0, 1, X) = \{(q_0, XX)\}$
 - $\delta(q_0, 0, X) = \{(q_1, \varepsilon)\}$
- (10 Marks)
- 6 a. Consider the grammar:
- $$S \rightarrow aAa \mid bBb \mid \varepsilon$$
- $$A \rightarrow C \mid a$$
- $$B \rightarrow C \mid b$$
- $$C \rightarrow CDE \mid \varepsilon$$
- $$D \rightarrow A \mid B \mid ab$$
- Are there any useless symbols? Eliminate them if so.
 - Eliminate ε - productions
 - Eliminate unit productions
 - Put the resulting grammar into CNF.
- (10 Marks)
- b. Show that the language $L = \{a^n b^n i \mid n \leq i \leq 2n\}$ is not context-free. (05 Marks)
- c. Prove that if L is a CFL and R is a regular language, then $L \cap R$ is a CFL. (05 Marks)
- 7 a. Define Turing machine. Design a Turing machine to accept the language $L = \{ww^R \mid w \text{ is in } \{0,1\}^*\}$. Also show the sequence of moves made by the Turing machine for the string 0110. (12 Marks)
- b. Prove that if M_N is a nondeterministic Turing machine, then there is a deterministic Turing machine M_D such that $L(M_N) = L(M_D)$. (08 Marks)
- 8 a. Define the following:
- Recursive and recursively enumerable languages. (04 Marks)
 - Decidable and undecidable problems. (06 Marks)
- b. Prove that if a language L and its complement are recursively enumerable, then L is recursive. (06 Marks)
- c. Define Post's Correspondence Problem. With suitable example, briefly explain PCP and its variant Modified PCP. Also comment on how PCP problem is undecidable. (10 Marks)

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