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10IS51

Fifth Semester B.E. Degree Examination, Aug./Sept.2020

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 is software engineering? What are the key challenges that a software engineering is facing? (05 Marks)
- b. With a block diagram, explain the different phases of systems engineering process. (10 Marks)
- c. Explain why legacy systems may be critical to the operation of a business. (05 Marks)
- 2 a. What are critical systems? List and explain different types of critical systems. (06 Marks)
- b. Explain Boehm's spiral model of the software process with a neat diagram. (08 Marks)
- c. Describe different phases in the Rational Unified Process. (06 Marks)
- 3 a. What are non-functional requirements? How are they different from functional requirements? Give examples. (06 Marks)
- b. Explain the structure of requirements document. (06 Marks)
- c. With a neat diagram, explain the requirement engineering process in detail. (08 Marks)
- 4 a. Define data-flow model. Give data flow diagram for an Insulin pump. (06 Marks)
- b. State and explain different management activities. (08 Marks)
- c. Explain risk management process with a neat diagram. (06 Marks)

PART – B

- 5 a. What are the advantages and disadvantages of object oriented design? (06 Marks)
- b. Explain client-server model with example. (08 Marks)
- c. Write a note on control styles. (06 Marks)
- 6 a. Give a brief description of principles of agile methods. (06 Marks)
- b. With a neat diagram, explain the system evolution process. (08 Marks)
- c. Explain the activities of re-engineering process. (06 Marks)
- 7 a. Explain the structures of a software test plan. (06 Marks)
- b. With a neat figure, explain the clean room software development process. (08 Marks)
- c. Explain the goals of software testing process. (06 Marks)
- 8 a. Briefly explain the factors that may influence the decision of selecting staff for the project team. (07 Marks)
- b. Explain the factors affecting software pricing. (07 Marks)
- c. Write a note on people capability maturity model (06 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, Aug./Sept.2020
System Software

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Explain the architecture of SIC/XE machine. (12 Marks)
 b. Suppose that ALPHA and BETA are two arrays of 100 words. Another array of GAMMA elements are obtained by multiplying the corresponding ALPHA element by 4 and adding the corresponding BETA element. Write sequence of SIC/Xe instruction for the above. (08 Marks)

- 2 a. Generate the complete object program for the following SIC/XE program.

SUM	START	0
FIRST	LDX	#0
	LDA	#0
	+LDB	#TABLE2
	BASE	TABLE2
LOOP	ADD	TABLE, X
	ADD	TABLE2, X
	TIX	COUNT
	JLT	LOOP
	+STA	TOTAL
	RSOB	
COUNT	RESW	1
TABLE	RESW	2000
TABLE 2	RESW	2000
TOTAL	RESW	1
	END	FIRST

Assume : LDX = 04, LDA = 00, LDB = 68, ADD = 18, TIX = 2C, JLT = 38, STA = 0C, RSOB = 4C. (10 Marks)

- b. What are fundamental functions of an assembler? Explain the data structures used in assemblers. (10 Marks)
- 3 a. Write algorithm for one pass assembler. Explain how forward references are handled in one pass assembler. (10 Marks)
 b. Give the format of the following records necessary to obtain object program.
 i) Text record ii) Define record iii) Refer record
 iv) Modification record (revised) v) Header record. (10 Marks)
- 4 a. With a diagram, explain how object program can be processed using linkage editor. (10 Marks)
 b. Briefly explain the boot strap loader with the algorithm/program. (10 Marks)

PART – B

- 5 a. What is an interactive editor? Explain the typical editor structure. (10 Marks)
b. Explain different debugging function and capabilities. (10 Marks)
- 6 a. Write algorithm for one-pass macro processor. (10 Marks)
b. Explain conditional macro expansion with an example. (06 Marks)
c. Briefly explain the data structures used in microprocessor. (04 Marks)
- 7 a. Write regular expression to identify the following :
i) Identifier ii) Decimal number iii) Negative integer iv) Positive fraction. (08 Marks)
b. Write a short note on parser – lexer communication. (04 Marks)
c. Explain three basic sections of a LEX program. (08 Marks)
- 8 a. Write a YACC program to function like a calculator which perform addition, subtraction, multiplication and division. (10 Marks)
b. Explain shift reduce parsing with an example. (10 Marks)

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Fifth Semester B.E. Degree Examination, Aug./Sept.2020
Operating Systems

Time: 3 hrs.

Max. Marks:100

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

PART – A

1. a. Define an operating system. List the operating systems responsibilities in connection with process management and memory management. (06 Marks)
- b. Explain the services provided by an operating system that are designed to make using computer systems more convenient for users. (06 Marks)
- c. With a neat diagram of VMware architecture, explain the concept of virtual machine and benefits of using virtual machine concept. (08 Marks)
2. a. Describe the function of various schedulers with a block diagram. (06 Marks)
- b. Explain the three multithreading models. (06 Marks)
- c. Consider the following set of process with a length of the CPU Burst time given in milliseconds.

Process	Arrival time	Burst time	Priority
P ₁	0	7	3
P ₂	3	2	2
P ₃	4	3	1
P ₄	4	1	1
P ₅	5	3	3

- i) Draw Gantt charts illustrating the execution of these processes using Shortest Remaining Time First (SRTF), preemptive priority and round robin scheduling (time slice = 1ms)(a smaller priority number implies higher priority)
- ii) Calculate average waiting time and average turn around time for each of the scheduling algorithm in part(i). (08 Marks)
3. a. Explain critical section problem. Along with an appropriate “C” struct explain the implementation of wait() and signal() semaphore operations. (10 Marks)
- b. Explain the solution to classical dining philosopher’s problem using monitor. (10 Marks)
4. a. What is deadlock? Describe the necessary conditions for a deadlock situation to arise in a system. (05 Marks)
- b. Explain deadlock detection mechanism for the system with single instance of each resource type. (05 Marks)
- c. Consider the following snapshot of a system :

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P ₀	0	1	0	7	5	3	3	3	2
P ₁	2	0	0	3	2	2			
P ₂	3	0	2	9	0	2			
P ₃	2	1	1	2	2	2			
P ₄	0	0	2	4	3	3			

Answer the following questions using Banker’s algorithm.

- i) What is the content of matrix NEED?
- ii) Is the system in “Safe State”?
- iii) If the process P₁ requests for one additional instance of resource type A and two instances of resource type C, can the request be granted immediately? (10 Marks)

PART – B

- 5 a. Consider the following page reference string :
7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1
for a memory with three frames. How many page faults would occur for LRU, FIFO and OPTIMAL replacement algorithm? (09 Marks)
- b. With a neat diagram explain paging with Translation Look aside Buffer (TLB). (06 Marks)
- c. Explain commonly used strategies for dynamic storage allocation. (05 Marks)
- 6 a. List any four common file types along with their extensions and functions. (04 Marks)
- b. Explain linked file allocation method, with advantages and disadvantages. (08 Marks)
- c. Describe the methods used for implementing directories. (08 Marks)
- 7 a. Suppose that a disk has 200 cylinders numbered from 0 to 99 and the drive is currently serving a request at cylinder 53. The previous request was at cylinder 70, (i.e, the disk arm is moving towards cylinder 0). The queue of pending requests is 98, 183, 37, 122, 14, 124, 65, 67. Illustrate the disk movement using FCFS, SSTF and SCAN disk scheduling algorithm. Also give the total head movement in each case. (09 Marks)
- b. Explain sector slipping with an example. (04 Marks)
- c. What is access matrix? Explain the implementation of access matrix using access lists for objects. (07 Marks)
- 8 a. Explain clone() system case in Linux. (05 Marks)
- b. Explain the components of kernel module support under Linux. (08 Marks)
- c. Explain process scheduling in Linux. (07 Marks)

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Fifth Semester B.E. Degree Examination, Aug./Sept.2020
Database Management Systems

Time: 3 hrs.

Max. Marks:100

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

PART - A

- 1
 - a. Explain the component modulus of DBMS and their interaction , with the help of a diagram. (10 Marks)
 - b. Briefly discuss the advantages of DBMS over flat file systems. (10 Marks)
- 2
 - a. With respect to ER model, explain with examples :
 - i) Cardinality Ratio
 - ii) Participation constraints. (04 Marks)
 - b. Define an Attribute. Explain different types of attributes that occur in an ER diagram. (08 Marks)
 - c. Design an ER diagram for keeping track of information about a hospital database taking into account atleast entities. (08 Marks)
- 3
 - a. Consider the following schema :
 SAILORS (Sid, Sname, rating , age)
 BOATS (bid , bname , color)
 RESERVES (Sid, bid , day)
 Specify the following queries in relational algebra.
 - i) Find the name of sailors who reserved green boat.
 - ii) Find the colour of the boat reserve by "Naresh".
 - iii) Find the name of the sailor who has reserved boat 1.
 - iv) Find the sid of sailors with age over 20 who have not reserved a red boat. (08 Marks)
 - b. Explain the need of primary and foreign keys, with suitable examples. (04 Marks)
 - c. Briefly discuss the different types of update operations on relational database. Show an example of violation of the referential integrity in each of the update operation. (08 Marks)
- 4
 - a. Explain the following : i) SELECT statement ii) ALTER command
 iii) Aggregate functions in SQL. (08 Marks)
 - b. Given the schema :
 EMP (fname , lname , Ssn , bdate , address , sex , salary , superssn, dno)
 DEPT (dname, dnumber, mgrssn, mgrstartdate)
 DEPT_LOC (dnumber, dloc)
 PROJECT (Pname, Pnumber , Ploc, dnum)
 WORKS_ON (essn, pno, hours)
 DEPENDENT (essn, dependent_name, sex)
 Write the SQL queries for the following :
 - i) List female employees from dno = 20 earning more than 50000.
 - ii) Find the name of employees who work on all projects controlled by department 5.
 - iii) Retrieve the names of such employees who are supervised by some other employer.
 - iv) List the name of all employees with atleast two dependents.
 - v) Select the name of employees whose 1st letter is R and 3rd letter is M.
 - vi) Retrieve the department name and average.
 Salary of such departments which have an average salary of such department which have an average salary more than 50000. Print the names of such departments in ascending order. (12 Marks)

PART - B

- 5 a. How are triggers and assertions defined in SQL? Explain with examples. (08 Marks)
b. Explain the following with examples :
i) DROP command ii) Dynamic SQL iii) Embedded SQL. (12 Marks)
- 6 a. What is Functional dependency? Write an algorithm to find a minimal cover for a set of function dependencies. (10 Marks)
b. What is the need of normalization? Explain first and second normal forms with examples. (10 Marks)
- 7 a. Explain Multivalued dependency and fourth normal form with an example. (10 Marks)
b. Explain : i) Inclusion dependencies ii) Template dependencies. (10 Marks)
- 8 a. Discuss the ACID properties of a database transaction. (04 Marks)
b. Describe the three phases of the ARIES recovery model. (08 Marks)
c. Briefly discuss the two phase locking protocol used in concurrency control. (08 Marks)

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10CS55

Fifth Semester B.E. Degree Examination, Aug./Sept. 2020
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 the five components of data communication system with simple diagram. (06 Marks)
- b. List the 3 criteria necessary for an effective and efficient network. (04 Marks)
- c. Write and explain OSI reference model. (10 Marks)
- 2 a. Explain the causes of transmission impairment. (08 Marks)
- b. Define : i) Bandwidth ii) Latency iii) Transmission time. (06 Marks)
- c. Represent the given sequence 010011 in
i) Unipolar ii) Manchester iii) AMI schemes. (06 Marks)
- 3 a. Explain FDM technique with a simple diagram. (08 Marks)
- b. Explain omnidirectional and unidirectional antenna with 2 applications. (08 Marks)
- c. List the 3 phases of a circuit switched network. (04 Marks)
- 4 a. Explain the working of encoder and decoder for hamming code, with a neat diagram. (10 Marks)
- b. Find the codeword, using CRC given dataword '1001' and generator '1011'. (10 Marks)

PART – B

- 5 a. Explain stop and wait protocol with sender and receiver algorithm. (10 Marks)
- b. Explain frame format and transition phases of point – to – point protocol. (10 Marks)
- 6 a. Explain :
i) Reservation controlled access
ii) FDMA. (12 Marks)
- b. Explain 802.3 MAC frame format. (08 Marks)
- 7 a. Write short note on :
i) IEEE 802.11 architecture
ii) Bluetooth. (10 Marks)
- b. With respect to the functionality define repeaters, bridges, routers, gateways. (10 Marks)
- 8 a. Draw IPv4 address format and explain. (10 Marks)
- b. Briefly discuss the advantages of IPv6. (06 Marks)
- c. Find the class of each address.
i) 00000001 00001011 00001011 11101111
ii) 11000001 10000011 00011011 11111111
iii) 14.23.120.8
iv) 252.5.15.111 (04 Marks)

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Fifth Semester B.E. Degree Examination, Aug./Sept.2020
Formal Languages and Automata Theory

Time: 3 hrs.

Max. Marks:100

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

PART - A

- 1 a. Define following terms :
 (i) Language (ii) Alphabet (iii) Power set (iv) Powers of an alphabet (v) Null string
 (05 Marks)
- b. Design a DFA for accepting strings of 0's and 1's containing two consecutive 0's in it.
 (05 Marks)
- c. Design a DFA for accepting binary number which are divisible by 5. (05 Marks)
- d. Design a DFA for accepting a sequence of a's and b's not ending with abb. (05 Marks)
- 2 a. Convert the following NFA to DFA. [Refer Fig.Q2(a)]

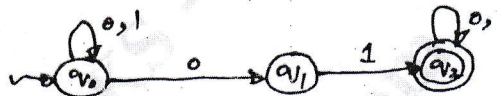


Fig.Q2(a)

(07 Marks)

- b. Define ϵ -NFA and ϵ -closure. (03 Marks)
- c. Convert the following ϵ -NFA to DFA. [Refer Fig.Q2(c)]

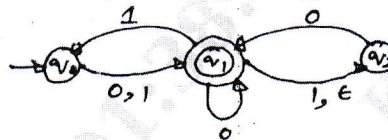


Fig.Q2(c)

(06 Marks)

- d. What are the applications of finite automata and regular expressions? (04 Marks)
- 3 a. State and prove pumping lemma of regular languages. (05 Marks)
- b. Prove that the language $L = \{ww^R : w \in \{a,b\}^*\}$ w^R is reverse of w is not regular. (05 Marks)
- c. Prove that regular languages are closed under intersection. (05 Marks)
- d. Prove that regular languages are closed under homomorphism. (05 Marks)
- 4 a. Define a context free grammar. Design a CFG which accepts all palindromes over a's and b's. (06 Marks)
- b. Define the following terms:
 (i) Derivation tree (ii) Yield of a tree (iii) Leftmost derivation
 (iv) Rightmost derivation (04 Marks)
- c. Design a CFG for accepting arithmetic expressions involving + and * operators. Check if your CFG is an ambiguous grammar or not. If it is an ambiguous grammar, then get an unambiguous grammar for the same. (10 Marks)

PART – B

- 5 a. Define a PDA and the languages accepted by it. (05 Marks)
 b. Design a NPDA for the language $L = \{a^n b^{2n} : n \geq 0\}$. (05 Marks)
 c. Design an NPDA for the language
 $L = \{a^n b^k c^m : k = n + m, n \geq 0, m \geq 0\}$ (05 Marks)
 d. Convert the following CFG to PDA.
 $S \rightarrow aB \mid bA$ $A \rightarrow aS \mid bAA \mid a$
 $B \rightarrow bS \mid aBB \mid b$ (05 Marks)
- 6 a. When a production becomes useless / nullable? What problem is faced when unit productions present in the grammar? Simplify the following CFG to CNF. (10 Marks)
 $S \rightarrow aSb \mid bSa \mid \epsilon \mid SS$
 b. Define pumping lemma of CFGs. Show that $a^n b^n c^n$ is not a CFL using the same. (05 Marks)
 c. Prove that context free languages are not closed under intersection and complementation operations. (05 Marks)
- 7 a. Define a Turing Machine. Design a TM for copying string of n 1's present in a tape to its right side. At the end of execution the number of 1's should be 2n in the tape. (10 Marks)
 b. Design a TM to accept any palindrome of a's and b's. (08 Marks)
 c. Design a TM that complements a given binary input. (02 Marks)
- 8 a. Define the diagonalization language. Show that for the language L_d , there is no turing machine exists. (10 Marks)
 b. Define recursive languages. With a diagram explain the relationship of recursive, RE and non RE languages. (06 Marks)
 c. What is post correspondence problem? Show that it is undecidable. (04 Marks)
