USN | | | | | | | | | | **10IS51**

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Software Engineering

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a. Define Software Engineering. Distinguish between Generic product and Customised product. **(06 Marks)**
    b. What are the key challenges facing software engineering? **(06 Marks)**
    c. Define Legacy systems. Explain Legacy system components, with a neat sketch. **(08 Marks)**

2   a. Explain different types of Critical systems. Illustrate a simple safety critical system with insulin pump structure. **(10 Marks)**
    b. With a neat diagram, explain Boehm's Spiral Model of software process. **(10 Marks)**

3   a. Explain Rational Unified Process. **(06 Marks)**
    b. Illustrate with a sequence diagram, cash withdraw process from an ATM. **(08 Marks)**
    c. Give the structure of software requirements document in IEEE format. **(06 Marks)**

4   a. Describe Ethnography and Prototyping for requirement analysis. **(06 Marks)**
    b. With a neat sketch, explain State Machine model of a Microwave oven. **(08 Marks)**
    c. Explain with suitable example Risk Identification Process. **(06 Marks)**

PART – B

5   a. What are the advantages of Repository Model? Explain Client – Server model with diagram. **(10 Marks)**
    b. Define Object and Class with example. Explain the object oriented design process. **(10 Marks)**

6   a. Describe the basic principles of Agile development methods. **(10 Marks)**
    b. Define Program Evolution Dynamics. Explain Lehman's laws of software system growth and evolution. **(10 Marks)**

7   a. Explain : i) Verification   ii) Validation   iii) System testing   iv) Test case design. **(10 Marks)**
    b. What are Formal methods? Explain their significance in software development process. **(10 Marks)**

8   Write short notes on the following :
    a. People Capability Maturity Model.
    b. Waterfall Model.
    c. Performance testing.
    d. Functional and Non – functional requirements. **(20 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐ **10CS52**

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
System Software

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define system software. Explain SIC/XE machine architecture in detail. **(12 Marks)**
  b. Assemble the following instructions :

002A	J	@RETADR
0003	+JSUB	WRREC
0000	LDA	#5
0000	STL	RETADR

  Where the symbol addresses : WRREC(1036), RETADR(0030) and
  The OPcodes : LDA – 00, JSUB – 48, STL – 14, J – 3C. **(08 Marks)**

2 a. What is meant by assembler directive? Explain the following directives with suitable example : RESW, LTORG, USE, EQU. **(08 Marks)**
  b. Write the formats of text record and modification record. **(04 Marks)**
  c. Explain Pass–1 algorithm of assembler and two major internal data structures used by it. **(08 Marks)**

3 a. How does the assembler handle external references? **(10 Marks)**
  b. How do the one pass and mulitpass assemblers handle forward references? **(10 Marks)**

4 a. Explain in detail the SIC relocation loader algorithm with relevant example. **(08 Marks)**
  b. Write Pass-2 algorithm of linking loader. **(06 Marks)**
  c. Differentiate the processing of an object program by linking loader and linkage editor. **(06 Marks)**

PART – B

5 a. Describe editor structure with a neat block diagram. **(10 Marks)**
  b. Explain the different debugging function and debugging capabilities. **(10 Marks)**

6 a. Define Marco. Briefly explain the macroprocessor algorithm and data structure used by it. **(12 Marks)**
  b. What is nested macro? Write down the procedure for recursive macro expansion. **(08 Marks)**

7 a. List out any six meta characters with suitable examples. **(06 Marks)**
  b. Write a Lex program to count the words, characters and lines of a given file. **(04 Marks)**
  c. Explain the lexical analysis phase of compilation and write down the structure of a Lex program. **(10 Marks)**

8 a. State ambiguous grammar with an example. How to eliminate ambiguity? **(08 Marks)**
  b. Write a Yacc program to design a simple calculator. **(08 Marks)**
  c. Write down the compilation and execution procedure of a simple Lexer and parser. **(04 Marks)**

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Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Operating System

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 an operating system? Explain abstract view of component of a computer system.
                                                                    (07 Marks)
   b. List the different services that an operating system provides. Explain.   **(06 Marks)**
   c. Explain the concept of virtual machines. Bring out its advantages.   **(07 Marks)**

2 a. What is a process? With a state diagram, explain states of a process.   **(06 Marks)**
   b. Describe the implementation of IPC using shared memory and message passing.   **(07 Marks)**
   c. Consider the following set of process,

Process	Arrival time	Burst time
P_1	0	6
P_2	2	3
P_3	4	3
P_4	5	5

   i) Draw the Gantt chart showing the execution of the following process FCFS, SRTF and RR (quantum = 1 m sec)
   ii) Compute the turnaround time, waiting time and average waiting time for each process.   **(07 Marks)**

3 a. What is Busy waiting in a critical section concept? How semaphore is used to solve critical section problem? What are the advantages of semaphores?   **(10 Marks)**
   b. What is a monitor? Explain the solution to the classical dining philospher's problem, using monitor.   **(10 Marks)**

4 a. Explain Resource-Request algorithm.   **(06 Marks)**
   b. What is a Deadlock? Briefly explain the methods for handling deadlocks.   **(06 Marks)**
   c. Consider a system with five processes P_0 through P_4 and three resources A, B, C Resources A has ten instances, resources type B has five instance and resource type C has seven instances. Suppose that at time To the following snapshot of the system has been taken.

Processes	Allocation A	Allocation B	Allocation C	Max A	Max B	Max C	Available A	Available B	Available 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			

   (i) Is the system in a safe state?
   (ii) If a request from P_1 arrives for (1, 0, 2) can the request be granted immediately.   **(08 Marks)**

PART – B

5 a. Give the difference between (i) Internal and external fragmentation (ii) Paging and segmentation. **(06 Marks)**

   b. Discuss the steps involved in handling page faults with diagram. **(06 Marks)**

   c. 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 page replacement algorithm? Which is the most efficient among them? **(08 Marks)**

6 a. Explain the following (i) file types (ii) file operations (iii) file attributes **(12 Marks)**

   b. Explain the methods used for implementing directories. **(08 Marks)**

7 a. Suppose a disk drive has 5000 cylinders numbered 0 to 4999. Drive is currently serving request a cylinder 143 and previous request was at cylinder 125, queue of pending requests in FIFO order is 86, 1470, 913, 1774, 948, 1509, 1022, 1756, 130 starting from current head position, what is the total distances (in cylinder) that the disk arm moves to satisfy all pending request for FCFS, SSTF, LOOK and SCAN disk scheduling algorithm. **(10 Marks)**

   b. Explain access matrix with examples. **(05 Marks)**

   c. Explain the various questioning that arise in revocation of access rights. **(05 Marks)**

8 a. Distinguish between fork ( ) and clone ( ) system call. Also customize the clone ( ) system call to fork ( ) functionality with suitable modifications / settings. **(08 Marks)**

   b. Explain the Linux device drive with the block structure. **(12 Marks)**

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10CS54

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
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 modules of DBMS and their interaction, with the help of a diagram.
                                                                                        (10 Marks)
   b. Explain the different categories of End Users who access the database.   **(05 Marks)**
   c. Explain the different types of languages and interfaces provided by DBMS.   **(05 Marks)**

2 a. Explain the main phases of database process, with the help of diagram.   **(10 Marks)**
   b. Design an E-R diagram for keeping track of information about AIRLINE database taking into account at least FIVE entities.   **(10 Marks)**

3 a. 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.   **(10 Marks)**
   b. Consider the following two tables R and S, show the results of the following operations?

   i) $R \bowtie_{R \cdot X \,=\, S \cdot A} S$

   ii) $R \bowtie_{R \cdot y \,=\, S \cdot B} S$

   iii) $R ⟕_{R \cdot X = S \cdot A} S$

   iv) $R \bowtie_{(R \cdot X \,=\, S \cdot A \text{ AND } R \cdot Z \,=\, S \cdot C)} S$

   v)   R U S

   (Assume R and S are union compatible)   **(10 Marks)**

R		
X	Y	Z
7	a	3
14	b	5
21	a	6

S		
A	B	C
7	b	6
21	c	2
7	b	3

4 a. Describe the SIX clauses in the syntax of an SQL retrieval query and give examples for each.   **(10 Marks)**
   b. Consider the following schema for a company database :
      EMPLOYEE(Name, Ssn, Address, Sex, Salary, Super_ssn, Dno)
      DEPT_LOCATIONS(Dnumber , Dlocation)
      DEPARTMENT(Dname, Dnumber, Mgr_ssn, Mgr_start_date)
      PROJECT(Pname, Pnumber, Plocation, Dnum)
      WORKS_ON(Essn, Pno, Hours)
      DEPENDENT(Essn, Dependent_name, Sex, Bdate, Relationship)
      Write the queries in SQL for the following :
      i)   Retrieve the name of each employee who has a dependent with the same name and same sex as the employee
      ii) List the names of mangers who have at least one dependent
      iii) For each employee, retrieve the employee's name and name of his or her immediate supervisor
      iv) Show the resulting salaries if every employee working on the 'ProductX' project is given a 15 percent raise
      v)   For each project on which more than two employees work, retrieve the project number, the project name, and the number of employees who work on the project.   **(10 Marks)**

PART – B

5 a. Explain the syntax of insert, delete and update statements in SQL and give examples for each. **(10 Marks)**

   b. How triggers and assertions are defined in SQL? Explain with an example. **(10 Marks)**

6 a. Explain the informal design guidelines for relation schemas. **(10 Marks)**

   b. What is functional dependency? Write an algorithm to find a minimal cover for a set of functional dependencies? Calculate the minimal cover of $F = \{A \to BC, B \to C, AB \to D\}$? **(10 Marks)**

7 a. Define multivalued dependency. Explain 4NF with an example. **(10 Marks)**

   b. Let R = {Ssn, Ename, Pnumber, Pname, Plocation, hours} and D = {R1, R2, R3}, where
   R1 = EMP = {Ssn, Ename}
   R2 = PROJ = {Pnumber, Pname, Plocation}
   R3 = WORKS_ON = {Ssn, Pnumber, hours}
   The following functional dependencies hold on relation R.
   F = {Ssn → Ename; Pnumber → {Pname, Plocation } ; {Ssn , Pnumber } → hours}
   Prove that the above decomposition of relation R has the lossless join property. **(10 Marks)**

8 a. What is meant by the concurrent execution of a database transaction in a multiuser system? Why concurrency control is needed, and give informal examples? **(10 Marks)**

   b. Briefly discuss the two-phase locking techniques used for concurrency control. **(10 Marks)**

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Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Computer Networks – I

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 in detail about the layers in OSI model with a neat diagram. **(10 Marks)**
　b. Briefly explain different addressing modes used in TCP/IP protocol suite. **(05 Marks)**
　c. Define protocol and identify the different elements of a protocol. **(05 Marks)**

2　a. For the given string 11011001 represent the unipolar, polar NRZ, Manchester and differential Manchester encoding techniques. **(05 Marks)**
　b. Identify the different transmission impairments observed in data transfer. **(05 Marks)**
　c. A telephone line has a bandwidth of 3000 Hz assigned for data communication. The SNR ratio is 3162. Calculate the capacity of the channel. (SNR refers to signal to noise ratio). **(05 Marks)**
　d. Explain the concept of shift keying. **(05 Marks)**

3　a. Define multiplexing and elaborate it in the context of time division multiplexing. **(05 Marks)**
　b. Elaborate the concept of circuit switches, datagram networks and virtual circuit networks with block diagrams. **(10 Marks)**
　c. The advanced mobile phone system uses two bands. The first band of 824 to 849 MHz is used for sending and 869 to 894 MHz is used for receiving. Each user has a bandwidth of 30 kHz in each direction. The 3 kHz voice is modulated using FM, creating 30 kHz of modulated signal. How many people can use their cellular phones simultaneously? **(05 Marks)**

4　a. Discuss about Hamming distance used in error control. **(05 Marks)**
　b. Briefly explain about linear block codes with emphasis on parity check code. **(05 Marks)**
　c. For a Augmented data word of $x^6 + x^3$, and the divisor 1011 which is represented as $x^3 + x + 1$. Calculate the code word, by using cyclic code encoder using polynomials. **(10 Marks)**

PART – B

5　a. Compare and contrast the Go Back N-ARQ protocol with selective repeat ARQ. **(10 Marks)**
　b. Define framing and explain its need in data link layer. **(05 Marks)**
　c. Assume that, in a stop and wait ARQ system, the bandwidth of the line is 1 Mbps and 1 bit takes 20 ms to make a round trip. What is the bandwidth delay product? **(05 Marks)**

6　a. Define controlled access in MAC sublayer and explain the three methods in this category. **(10 Marks)**
　b. Define channelization with its supporting protocols. **(05 Marks)**
　c. A pure ALOHA network transmits 200 bit frames on a shared channel of 200 Kbps. What is the throughput if the system produces 1000 frames/sec. **(05 Marks)**

7　a. Explain the architecture used in IEEE 802.11 protocol. **(10 Marks)**
　b. How is a repeater different from amplifier? **(05 Marks)**
　c. What is GSM and explain its features. **(05 Marks)**

8　a. What is NAT and how can NAT help in address depletion? **(05 Marks)**
　b. Compare and contrast the fields in the main headers of IPV4 and IPV6 protocols. **(10 Marks)**
　c. Change the following IPV4 addresses from dotted decimal notation to binary notation:
　　i) 111.56.45.78　　　ii) 221.34.7.82 **(05 Marks)**

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10CS56

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Formal Language and Automata Theory

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a. Define the following terms with an example for each,
       (i) String   (ii) Alphabet   (iii) Power set   (iv) Language   **(08 Marks)**
    b. Give the difference between NFA and DFA.   **(06 Marks)**
    c. Design DFA for the following languages on set $\sum = \{a, b\}$:
       (i)   Set of all strings that either begins, ends and both with the string 'ab'.
       (ii) $L = \{W / |W| \bmod 5 <> 0\}$
       (iii) String with even number of a's and b's.   **(06 Marks)**

2   a. Write a note on applications of finite automata.   **(04 Marks)**
    b. Define an $\in -NFA$ and $\in -closure$. Design an $\in -NFA$ for a language (a / b) * abb.
                                                                               (08 Marks)
    c. Prove that for every regular expression their exist a Finite Automata which accepts the same
       language accepted by the Regular expression.   **(08 Marks)**

3   a. State and prove pumping lemma for regular language and prove that the language
       $L = \{a^P \mid P \text{ is a prime number}\}$ is not regular.   **(08 Marks)**
    b. Construct the NFA for the following transition table.

δ	0	1
→q_1	q_2	q_3
q_2	q_3	q_5
*q_3	q_4	q_3
q_4	q_3	q_5
*q_5	q_2	q_5

       (i)   Draw the table of distinguishable and indistinguishable states for the Automata.
       (ii)   Construct minimum state equivalent DFA using Table filling algorithm.   **(12 Marks)**

4   a. Define Context free Grammer. Give the CFG for the following language over set
       $\sum = \{a, b\}$.
       (i) $L = \{a^i b^j c^k / i = j + k \mid i, j, k >= 0\}$.
       (ii) $L = \{w / n_a(w) = n_b(w)\}$
       (iii) $L = \{w / n_a(w) \text{ is divisible by 3}\}$
       (iv) $L = \{a^{n+2} b^m / n >= 0, m > n\}$ **(10 Marks)**
    b. Let G be a Grammar and the set of production are,
       $S \rightarrow aB / bA$
       $A \rightarrow a / aS / bAA$
       $B \rightarrow b / bS / aBB$
       Give the
       (i)   right most derivation   (ii)   left most derivation and
       (iii) derivation tree for the string "aaabbabbba"   **(06 Marks)**
    c. What is an ambiguous Grammar? Prove that the following Grammar is ambiguous on string
       "aab"
       $S \rightarrow aS / aSbS / \in$ **(04 Marks)**

PART – B

5   a.   Define PDA and construct PDA that accepts the following language:

$L = \{w / w \in \{a, b\}^* \text{ and } n_a(w) = n_b(w)\}$

Write the instantaneous description for the string "aababb"   (12 Marks)

b.   Convert the following Grammar to PDA that accepts the same language by empty string,

$S \rightarrow bABC / aBaB$

$A \rightarrow aA / bBaC / a$

$B \rightarrow bBb / a$

$C \rightarrow bCA / aAC$

$C \rightarrow d$ (08 Marks)

6   a.   Convert the following Grammar into Chomsky Normal form,

$S \rightarrow ABa$

$A \rightarrow aab$

$B \rightarrow Ac$ (06 Marks)

b.   Eliminate useless production from the Grammar given below:

$S \rightarrow aS / A \mid C$

$A \rightarrow a$

$B \rightarrow aa$

$C \rightarrow aCb$ (06 Marks)

c.   State and prove pumping lemma for CFL and show that $L = \{a^n b^n c^n / n >= 0\}$ is not a context Free Language.   (08 Marks)

7   a.   Explain with a neat diagram, the working of Turing machine.   (06 Marks)

b.   Design a TM to accept all sets of palindrome over $\{a, b\}^*$, also write the transition diagram, instantaneous description and give the sequence of moves made by TM for string "babab"   (14 Marks)

8   Write short notes on:

a.   Post correspondence problem.

b.   Multitape TM.

c.   Turing machine Halting problem.

d.   Recursive language.   (20 Marks)

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