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

Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Software Engineering

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. Explain the term software engineering and system engineering; mention the important attributes of good software products. **(06 Marks)**
   b. What is a software process model? Explain the types of software process models. **(06 Marks)**
   c. What are legacy systems? Explain the components of legacy system with neat diagram. **(08 Marks)**

2 a. What are critical systems? Explain the different types of critical systems. **(06 Marks)**
   b. With block diagram, explain water fall process model. Mention the advantages and disadvantages of waterfall model. **(08 Marks)**
   c. Explain the requirement engineering process with diagram. **(06 Marks)**

3 a. Mention the differences between functional and non-functional requirements. Give example for each. **(06 Marks)**
   b. Explain the structure of the requirements documents. **(08 Marks)**
   c. Explain the following: i) Ethnography   ii) Scenarios. **(06 Marks)**

4 a. Explain different types of system models. **(06 Marks)**
   b. Differentiate between milestones and deliverables. **(02 Marks)**
   c. List the activities of risk management with diagram. **(04 Marks)**
   d. What are project management activities? Explain. **(08 Marks)**

PART – B

5 a. With an example describe the repository model and give its advantages and disadvantages. **(08 Marks)**
   b. Draw and explain state diagram for a typical weather station. **(08 Marks)**
   c. Define control styles. **(04 Marks)**

6 a. Explain the principle of agile methods. **(06 Marks)**
   b. What is prototype? Explain the process prototype development with diagram. Mention the advantages of using prototype. **(08 Marks)**
   c. With a neat diagram describe the system evolution process. **(06 Marks)**

7 a. Explain the following : i) Unit testing   ii) Integration testing **(06 Marks)**
   b. Explain clean Room software development. **(08 Marks)**
   c. List classes of interface errors. **(06 Marks)**

8   Write short notes on the following :
   a. IEEE/ACM code of Ethics
   b. The client server model
   c. Lehman's laws
   d. Software cost estimation techniques. **(20 Marks)**

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Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
System Software

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. What is system software? Explain the features of SIC machine architecture.   **(10 Marks)**
   b. Explain SIC/XE machine architecture formats and all addressing modes by clearly indicating the setting of different flag bits.   **(10 Marks)**

2 a. Write and explain the algorithm of PASS-1 of two-pass assembler.   **(10 Marks)**
   b. Generate the complete object codes for the following assembly level program and give reason if the code is not possible for any instruction.

```
SUM      START   O
FIRST    LDX     #D
         LDA     #O
         +LDB    #TABLE2
LOOP     ADD     TABLE, X
         ADD     TABLE2, X
         TIX     COUNT
         JLT     LOOP
         +STA    TOTAL
         STA     @TOTAL
         RSUB
COUNT    RESW    1
TABLE    RESW    3000
TABLE2   RESW    3000
TOTAL    RESW    1
         END     FIRST
```

Assume below opcodes (all in hexadecimal) LDX = 04, LDA = 00, LDB = 68, ADD = 18, TIX = 2C, JLT = 38, STA = 0C, RSUB = 4C.   **(10 Marks)**

3 a. Compare a two-pass assembler with a one-pass assembler. How forward references are handled in one pass assemblers?   **(10 Marks)**
   b. Discuss the detailed design of a linking and relocating loader.   **(05 Marks)**
   c. Explain in detail program blocks.   **(05 Marks)**

4 a. Give and explain the algorithm or source program for a simple Bootstrap loader.   **(08 Marks)**
   b. Explain the various data structures used for a linking loader.   **(07 Marks)**
   c. With examples explain any FIVE loader options.   **(05 Marks)**

PART – B

5 a. Explain the structure of a text editor, with a neat diagram. **(10 Marks)**
   b. Explain briefly the debugging functions. **(06 Marks)**
   c. List the important tasks to be accomplished by a text editor for an interactive user computer dialogue. **(04 Marks)**

6 a. Define Macro. Discuss in detail the various data structures used in the implementation of a one-pass macro processor. **(10 Marks)**
   b. Explain the following features:
      i)   Concatenation of macro-parameters.
      ii) Generation of unique labels. **(10 Marks)**

7 a. Explain the structure of LEX. **(06 Marks)**
   b. Discuss the Lexer-Parser communication. **(04 Marks)**
   c. Write the LEX program to count the number of words, number of characters, number of lines from the input file. **(10 Marks)**

8 a. Explain the regular expressions with proper examples. **(06 Marks)**
   b. Explain the shift reduce parser. **(05 Marks)**
   c. Write program in LEX and YACC to recognize whether the given arithmetic expression is valid or invalid. **(07 Marks)**
   d. Define recursive rule. Give an example. **(02 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐ **10CS53**

Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Operating Systems

Time: 3 hrs. Max. Marks:100

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

PART – A

1   a. Distinguish between the following pairs of terms :
      i)   Symmetric and asymmetric multiprocessor systems
      ii) Cpu burst and I/O burst jobs
      iii) User's view and systems view of OS
      iv) Batch systems and time sharing systems
      v)   User mode and kernel mode operations.   **(10 Marks)**
    b. List the three main advantages of multiprocessor systems. Also bring out the difference between graceful degradation and fault tolerance in this context.   **(05 Marks)**
    c. What are virtual machines? How are they implemented?   **(05 Marks)**

2   a. What is a process? What are the states a process can be in? Give the process state diagram clearly indicating the conditions for a process to shift from one state to another.   **(08 Marks)**
    b. What are the merits of inter process communication? Name the two major models of inter process communication.   **(06 Marks)**
    c. What is a thread? What is need for multithreaded processes? Indicate the four major categories of benefits derived from multi threaded programming.   **(06 Marks)**

3   a. What is a critical section problem? What requirements should a solution to critical section problem satisfy? State Peterson's solution and indicate how it satisfies the above requirements.   **(10 Marks)**
    b. Explain the operation of semaphores. Bring out how their operation may lead to priority inversion.   **(10 Marks)**

4   a. Define deadlock. What are the necessary conditions for deadlock to occur? Indicate how many of these should occur for dead lock to happen?   **(10 Marks)**
    b. State and explain banker's algorithm for deadlock avoidance.   **(10 Marks)**

PART – B

5   a. What is the principle behind paging? Explain its operation, clearly indicating how the logical addresses are converted to physical addresses.   **(10 Marks)**
    b. A hypothetical main memory can store only 3 frames simultaneously. The sequence in which the pages will be required is given below:
      7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 (Twenty operations).
      Indicate the sequence in which the three frames will be filled in i) FIFO   ii) Optimal Page Replacement and iii) Least Recently used methods of page replacement. Indicate number of page faults in each case.   **(10 Marks)**

6   a. List any five typical file attributes and any five file operations indicating their purpose in one line each.   **(10 Marks)**
    b. Briefly explain the methods of keeping track of free space on disks,   **(10 Marks)**

7   a. What is disk scheduling? Discuss different disk scheduling techniques.   **(12 Marks)**
    b. Explain the capability lists methods of implementing access matrix.   **(08 Marks)**

8   a. How does Linux achieve interprocess communication?   **(10 Marks)**
    b. How does Linux manage authentication and access control mechanisms?   **(10 Marks)**

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Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Database Management Systems

Time: 3 hrs.

Max. Marks:100

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

PART – A

1 a. Explain with a neat diagram, the component modules of DBMS. **(10 Marks)**
   b. Define DBMS. Discuss the advantages of DBMS over traditional file system. **(06 Marks)**
   c. Explain additional implications of using database approach. **(04 Marks)**

2 a. Discuss the concepts related to structural constraints of relationship type with suitable examples. **(10 Marks)**
   b. Write an ER diagram for hospital management considering at least four entities. **(10 Marks)**

3 a. List any five relational algebra operators along with their syntax and purpose. **(10 Marks)**
   b. Consider the following COMPANY database:
      EMP (Name, SSN, Salary, SuperSSN, Dno)
      DEPT (Dnum, Dname, MgrSSN)
      DEPT_LOC (Dnum, Dlocation)
      Works_ON (ESSN, Pno, Hours)
      Dependent (ESSN, Dep_name, Sex)
      Write the relational algebra queries for the following:
      (i)   Retrieve the name of the employee who works in the same department as that of "Ravi".
      (ii) Retrieve the number of dependents for an employee named "Ravi".
      (iii) Retrieve the name of managers working in location "DELHI" who has no female dependents. **(10 Marks)**

4 a. Explain with suitable example, how can you retrieve information from multiple tables. **(08 Marks)**
   b. Referring to the COMPANY database above, write SQL queries for the following:
      (i)   Retrieve the name of employees whose salary is greater than all employees working in department 3.
      (ii) For each department that has more than four employees, retrieve the department number and the number of its employees who have more than 4000 salary.
      (iii) Retrieve name of an employee who gets second highest salary. **(12 Marks)**

PART – B

5 a. Explain with example, how assertions are defined. **(05 Marks)**
   b. What is a view? Explain how views are created and dropped. **(05 Marks)**
   c. What is a cursor? Explain with example, retrieving multiple tuples with embedded SQL. **(10 Marks)**

6 a. Explain update anomalies with examples.   (05 Marks)
   b. What is a functional dependency? List the conditions for a set of functional dependencies to
       be minimal.   (05 Marks)
   c. Consider the relation R(A, B, C, D, E, F) and the functional dependencies $A \rightarrow B$,
       $C \rightarrow DF$, $AC \rightarrow E$, $D \rightarrow F$. What is the primary key of this relation R? What is its highest
       normal form? Preserving the dependency, decompose R into third normal form.   (10 Marks)

7 a. Explain properties of relational decomposition.   (05 Marks)
   b. Which normal form specifies multivalued functional dependency? Explain it with examples.
                                                                                                      (10 Marks)
   c. Define inclusion dependency, and write the inference rules for it.   (05 Marks)

8 a. Explain transition diagram of a transaction.   (06 Marks)
   b. Explain the principles used behind ARIES algorithm.   (06 Marks)
   c. What is a schedule? Explain conflict serializable schedule with example.   (08 Marks)

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Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Computer Networks – I

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 fundamental characteristics and components of a data communication system.
　　　　　　　　　　　　　　　　　　　　　　　　　　　　(08 Marks)
　b.　With a neat diagram explain the TCP/IP protocol suite mentioning the different layers and their functions in TCP/IP. Why is TCP/IP called a defacto standard? **(08 Marks)**
　c.　Explain the different addresses used in TCP/IP and diagrammatically indicate how they are related to different layers in TCP/IP. **(04 Marks)**

2　a.　Mention and explain with reasons the causes of impairment of transmission of signals through transmission media. **(08 Marks)**
　b.　What is pulse code modulation (PCM)? Draw the block schematic of a PCM encoder indicating different components and relevant waveforms for the input voltage
　　　$v(t) = 2t$ for $t = 0$ to $t = T/2$ 　and　 $v(t) = 0$ for $t = T/2$ to T. **(08 Marks)**
　c.　The human voice normally contains frequencies from 0 to 4000 Hz. What is the minimum sampling rate as per Nyquist theorem? Assuming 8-bits/sample, what is the bit rate?
　　　　　　　　　　　　　　　　　　　　　　　　　　　　(04 Marks)

3　a.　When is the use of multiplexing justified? Mention and explain different types of multiplexing. **(08 Marks)**
　b.　Describe the different switched networks used in computer networks, mentioning specifically which of these need setup, transfer and teardown phase. **(08 Marks)**
　c.　A path in a digital circuit switched network has a data rate of 1 Mbps. Exchange of 1000 bits is required for setup and 1000 bits for teardown. The distance between two parties is 8000 km. calculate the total time required to transfer 2000 bits of data if acknowledgement requires exchange of 500 bits and tearing down of connection is initiated from source assuming no error in data transmission, no processing delay and propagation speed in connecting medium 2×10^8 m/s (Protocol ends with sending of tearing down message from source side). **(04 Marks)**

4　a.　For the following code find the minimum Hamming distance.

Data word	Code word
0 0	0 0 0 0 0
0 1	0 1 0 1 1
1 0	1 0 1 0 1
1 1	1 1 1 1 0

Based on the minimum Hamming distance found, discuss the capabilities of this code. Represent the code in symbolic form. **(08 Marks)**
　b.　Draw the block schematic diagram for encoder and decoder which uses a standard polynomial CRC-8 $= x^8 + x^2 + x + 1$ for coding and decoding. Explain how code words are generated and errors in received code words are detected, if the message length is 8-bits, say 10101010. **(08 Marks)**

c. In a system using CRC (Cyclic Redency Check) for error detection the generation used is 1011 and codeword received is 1011110. Explain with reason what is the action taken at receiver. **(04 Marks)**

PART – B

5 a. In stop-and-wait automatic repeat request (Stop-and-wait ARQ), explain how is error control mechanism added to stop-and-wait protocol of noise free channel for a noisy channel. With frame flow diagram, explain how a frame is delivered when (i) it is delivered first time and acknowledged (ii) When it is lost (iii) when it is delivered but it's acknowledgement is lost. **(08 Marks)**

b. What is a High-Level Data Link Control (HDLC) protocol? Indicate in diagrammatic form, the frame format of different HDLC frames. Which field in these frames indicates the type of frame? **(08 Marks)**

c. Assume that in a stop-and-wait ARQ system the bandwidth of the line is 1 Mbps and 1 bit takes 10 ms for one way trip. What is the bandwidth-delay product? If the system data frames are 1000 bits in length, what is the utilization percentage of the link? **(04 Marks)**

6 a. Describe CSMA/CD access method with space/time model and indicate the requirements needed for this type of access. **(08 Marks)**

b. With a neat diagram describe the different fields and their lengths in bytes of standard Ethernet (802.3 MAC) frame. **(08 Marks)**

c. A network using CSMA/CD has a bandwidth of 10 Mbps. What should be the minimum size of frame if the maximum propagation time including delays in devices is 25.6×10^{-6} s. **(04 Marks)**

7 a. Describe how the communication takes place in wireless LANs with the help of CSMA/CA flowchart. Also explain how is collision avoided. **(08 Marks)**

b. Draw the schematic diagram of a cellular system in cellular telephony and describe how a call is made and a call is received by the mobile station. **(08 Marks)**

c. Advanced Mobile Phone System (AMPS) uses 824 MHz to 849 MHz (25 MHz) band for reverse communication and 869 MHz to 894 MHz (25 MHz) band for forward communication. Calculate the number of analog channels if the bandwidth of analog channel is 30.04 kHz. If AMPS has frequency reuse factor of 7, how many channels are available in a cell? **(04 Marks)**

8 a. Why is Network Address Translation (NAT) used in IPv4 protocol? Explain with example how the address of datagram gets changed? (Use private source address 198.168.0.1, NAT router address 200.24.5.8 and Destination address 25.8.2.10). **(08 Marks)**

b. Draw the diagram showing the IPv4 datagram format showing different fields with their length in bits. Explain the function of each field. **(08 Marks)**

c. In IPv4 datagram has arrived with the following information in the header (in hexadecimal)
OX 4500 0054 0003 5850 2006 0000 7C4E 0302 B40E 0F20
Answer the following questions:
(i) Is the packet fragmented? (Give reason to your answer)
(ii) What is the size of data?
(iii) How many routers the packet can travel to?
(iv) What is the identification of the packet in decimal? **(04 Marks)**

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10CS56

Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Formal Languages 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 Finite automata. Write the application of finite automata. **(05 Marks)**
   b. Design a DFA to accept the following language over the alphabet {0, 1}.
      i) $L = \{(01)^i \cdot 2^j \mid i \geq 1, j \geq 1\}$
      ii) $L = \{\omega : \mid \omega \mid \mod 3 = \mid \omega \mid \mod 2\}$ **(10 Marks)**
   c. What is NFA? Explain with example. **(05 Marks)**

2. a. Define Regular expression. Find regular expression for the following languages.
      i) $L = \{a^n b^m : (m + n) \text{ is even}\}$
      ii) Strings of a's and b's whose 3rd symbol from right is a. **(05 Marks)**
   b. Consider the following $\in$-NFA

δ	ε	a	b	c
→p	φ	p	q	r
q	p	q	r	φ
*r	q	r	φ	p

      i) Compute $\in$-closure of each state
      ii) Convert the automata to DFA **(10 Marks)**
   c. Obtain an $\in$-NFA for the regular expression $a^* + b^* + c^*$ **(05 Marks)**

3. a. If L and M are regular languages prove that L∩M is also regular. **(05 Marks)**
   b. Prove that the following language is not regular
      $L = \{0^n \mid n \text{ is prime}\}$ **(05 Marks)**
   c. Minimize the following DFA. **(10 Marks)**

   Fig Q3(c)
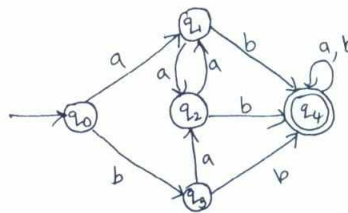
4. a. Define CFG. Write CFG for the language.
      $L = \{0^n 1^n \mid n \geq 1\}$ **(06 Marks)**
   b. Consider the grammar
      $E \rightarrow +EE \mid *EE \mid -EE \mid x \mid y$
      Find leftmost and rightmost derivation for the string +* − xyxy and write parse tree. **(08 Marks)**
   c. Write the application of CFG. **(06 Marks)**

PART – B

5 a. Design PDA for the language $L = \{\omega \mid \omega \in (a+b)^* \ \& \ n_a(\omega) = n_b(\omega)\}$ show that ID's for the string abbbaa and also write the transition diagram. **(12 Marks)**

  b. Convert the CFG to PDA by empty stack.
      $I \rightarrow a \mid b \mid Ia \mid Ib \mid I0 \mid I1$
      $E \rightarrow I \mid E*E \mid E+E \mid (E)$ **(08 Marks)**

6 a. Eliminate ε, unit and useless production from the following grammar and put the resulting grammar into CNF. **(12 Marks)**
      S→ABC|BaB
      $A \rightarrow aA|BaC|aaa$
      $B \rightarrow bBb|a|D$
      $C \rightarrow CA|AC$
      $D \rightarrow \varepsilon$

  b. State and prove pumping lemma for CFG. **(08 Marks)**

7 a. With a neat diagram, explain the working of basic Turing machine **(08 Marks)**

  b. Design TM to accept the language
      $L = \{0^n1^n \mid n \geq 1\}$ **(12 Marks)**

8   Write short notes on :
  a. Multitape Turing machine **(05 Marks)**
  b. Halting problem in TM **(05 Marks)**
  c. Post correspondence problem **(05 Marks)**
  d. Recursive languages. **(05 Marks)**

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