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

Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015

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. What is a software process model? Explain the types of software process models. **(06 Marks)**
b. Explain the key challenges facing software engineering. **(06 Marks)**
c. With a neat block diagram explain the systems engineering process activities. **(08 Marks)**

2 a. With a neat block diagram, explain the spiral process model. **(08 Marks)**
b. Define dependability. Also explain briefly the four principle dimensions of dependability. **(06 Marks)**
c. With appropriate block diagram explain briefly the requirement engineering process or software specification activities. **(06 Marks)**

3 a. For the set of tasks shown below draw the project scheduling using,
i) Activity chart.
ii) Gantt / Bar chart.
iii) Staff allocation versus time chart.
Assuming start date of project as 01 Nov.2014. **(10 Marks)**

Task	Duration	Dependency
T_1	8	-
T_2	15	-
T_3	15	$T_1(m_1)$
T_4	10	-
T_5	10	T_2, T_4 (m_2)
T_6	5	T_1, T_2 (m_3)
T_7	20	T_1 (m_1)
T_8	25	T_4 (m_4)

b. Draw a state machine model of a simple microwave oven. **(05 Marks)**
c. Draw a sequence diagram for withdrawing money from ATM. **(05 Marks)**

4 a. Write the IEEE format of writing SRS. **(05 Marks)**
b. Differentiate between:
i) User requirements and system requirements.
ii) Functional requirements and non-functional requirements. **(05 Marks)**
c. Explain briefly the techniques of requirements discovery. **(10 Marks)**

PART – B

5 a. List the system structuring styles and explain the repository model with a block diagram. **(06 Marks)**
b. With a neat block diagram, explain the object oriented decomposition for invoice processing sub-system. **(06 Marks)**
c. Explain briefly:
i) Call-Return control model.
ii) Broadcast control model. **(08 Marks)**

6 a. With appropriate block diagram explain briefly extreme programming process model. **(10 Marks)**

b. With appropriate block diagram, explain the system evolution process. **(10 Marks)**

7 a. Explain briefly the software inspection process. **(06 Marks)**

b. With a neat block diagram explain the verification and validation process (V-model). **(06 Marks)**

c. Perform the path testing for the following program flow graph by computing Cyclomatic complexity. **(08 Marks)**

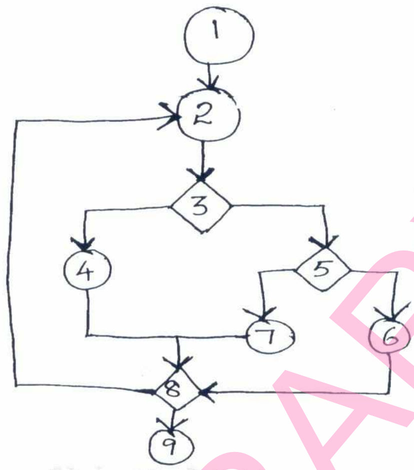

Fig. Q7 (c)

8 Write short notes on:

a. Legacy system.

b. Cocomo model.

c. Capability maturity model.

d. Software testing process. **(20 Marks)**

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Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015

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. Distinguish between system software and application software. **(04 Marks)**

b. Explain SIC/XE architecture. **(06 Marks)**

c. Write a SIC/XE program to copy array A of 100 words to array B of same size. **(06 Marks)**

d. What is upward compatible? How is it ensured between SIC and SIC/XE? **(04 Marks)**

2 a. Explain briefly the SIC assembler directives with examples. **(06 Marks)**

b. What is relocation? Illustrate how a modification record is used in relocation of program. **(04 Marks)**

c. Generate the machine codes for the following SIC/XE program.

```
COPY           START   1000
CLOOP          +JSUB   RDREC
               LDA     LENGTH
               COMP    ZERO
               JEQ     EXIT
               J       CLOOP
EXIT           STA     BUFFER
               LDA     THREE
               STA     TOTAL_LENGTH
               RSUB
BUFFER         RESW    100
EOF            BYTE    C 'EOF'
ZERO           WORD    0
THREE          WORD    3
LENGTH         RESW    1
TOTAL_LENGTH   RESW    1
RDREC          LDX     ZERO
```

MNEMONICS:

JSUB = A0, LDA = 80, LDX = 60, STA = 50,

COMP = 90, RSUB = 4C, JEQ = B0, J = B8 **(10 Marks)**

3 a. What is a literal? Differentiate literals from immediate data. **(04 Marks)**

b. Explain the following machine independent features of SIC assembler:

i) Symbol defining statements

ii) Control sections **(08 Marks)**

c. Explain the two design options of one-pass assembler. **(08 Marks)**

4 a. Write the algorithm of absolute loader. **(04 Marks)**

b. Write the algorithm of linking loader. **(10 Marks)**

c. Explain briefly the design options of loaders. **(06 Marks)**

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.

PART – B

5 a. List the basic tasks of a text editor. **(04 Marks)**
b. With a neat diagram, explain the text editor structure. **(06 Marks)**
c. List the user interfaces for editors with an example for each. **(04 Marks)**
d. What are the debugging functions and capabilities? **(06 Marks)**

6 a. Give the features of MACROPROCESSORS and explain the data structures used in macro processors. **(08 Marks)**
b. Explain the general purpose macroprocessors design option. **(04 Marks)**
c. For the following macro definition, expand the macro call statements called in sequence:
i) RDBUFF F1, BUFA, RLEN, 04, 1024
ii) RDBUFF F2, BUFB, RLNG, ,

```
RDBUFF MACRO &INDEV, &BUFADR, &RECLTH, &EOR, &MAXLTH
                  IF        (&EOR NE ' ')
        &EORCR    SET       1
                  ENDIF
                  CLEAR     X
                  CLEAR     A
                  IF        (&EORCR EQ1)
                  LDCH      =X '&EOR'
                  RMO       A, S
                  ENDIF
                  IF        (&MAXLTH EQ ' ')
                  +LDT      #4096
                  ELSE
                  +LDT      # &MAXLTH
                  ENDIF
        $LOOP     TD        =X '&INDEV'
                  JEQ       $LOOP
                  RD        =X '&INDEV'
                  STCH      &BUFADR, X
                  TIXR      T
                  JLT       $LOOP
                  STX       &RECLTH
                  MEND
```

(08 Marks)

7 a. List any ten regular expression in lex. **(10 Marks)**
b. Distinguish between LEXER and Handwritten lexer. **(04 Marks)**
c. Write lex program to compute word, character and line count in a given file. **(06 Marks)**

8 a. Explain the format of yacc program. **(04 Marks)**
b. Write lex-yacc program to validate simple arithmetic expression. **(08 Marks)**
c. Explain briefly lex and yacc interaction. **(04 Marks)**
d. Discuss conflicts in yacc. **(04 Marks)**

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USN | | | | | | | | | | **10CS53**

Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Operating Systems

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Differentiate between multiprogramming and multiprocessing. **(05 Marks)**
b. Explain the various functions of operating system with respect to process and memory management. **(05 Marks)**
c. What are the different ways in which the Pthread terminates? **(05 Marks)**
d. Explain any two facilities provided for implementing interacting process in programming language and operating system. **(05 Marks)**

2 a. Differentiate between :
i) User level and kernel level threads
ii) Process and thread. **(06 Marks)**
b. Following is the snapshot of a cpu

Process	CPU Burst	Arrival time
P_1	10	0
P_2	29	1
P_3	03	2
P_4	07	3

Draw Gantt charts and calculate the waiting and turnaround time using FCFS, SJF and RR with time quantum 10 scheduling algorithms. **(09 Marks)**
c. Explain different scheduling criteria that must be kept in mind while choosing different scheduling algorithms. **(05 Marks)**

3 a. Explain critical section problem. What are the requirements that critical section problem must satisfy? **(05 Marks)**
b. Explain Reader's – writers problem and provide a semaphore solution using semaphore's for reader's priority problem. **(10 Marks)**
c. What are monitors? Compare with semaphores with their relative advantages and disadvantages. **(05 Marks)**

4 a. Consider a system containing m resources of the same type being shared by n processes. Resources can be requested and released by processes only one at a time. Show that the system is deadlock free if the following two conditions hold :
   i) The maximum need of each process is between 1 and m resources
   ii) The sum of all maximum needs is less than m + n. **(10 Marks)**

b. For the given snapshot :

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_1	0	0	1	2	0	0	1	2	1	5	2	0
P_2	1	0	0	0	1	7	5	0				
P_3	1	3	5	4	2	3	5	6				
P_4	0	6	3	2	0	6	5	2				
P_5	0	0	1	4	0	6	5	6				

Using Banker's algorithm :
   i) What is the need matrix content?
   ii) Is the system in safe state?
   iii) If a request from process P2(0, 4, 2, 0) arrivers, can it be granted? **(10 Marks)**

PART – B

5 a. What is locality of reference? Differentiate between paging and segmentation. **(05 Marks)**

b. Explain the differences between :
   i) Logical and physical address space
   ii) Internal and external fragmentation. **(05 Marks)**

c. For the following page reference calculate the page faults that occur using FIFO and LRU for 3 and 4 page frames respectively , 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5. **(10 Marks)**

6 a. What are the different techniques with which a file can be shared among users? **(06 Marks)**

b. Given memory partitions of 100 k, 500 k, 200 k, 600 k (in order), which algorithm from best fit, worst fit and first fit places processes with requirements 212 k, 417 k, 112 k and 426 k in an efficient manner? **(06 Marks)**

c. Explain the various storage mechanisms available to store files, with neat diagram. **(08 Marks)**

7 a. Given the following queue 95, 180, 34, 119, 11, 123, 62, 64 with head initially at track 50 and ending at track 199 calculate the number of moves using FCFS, SSTF, Elevator and C look algorithm. **(12 Marks)**

b. What are access matrices? Explain its implementation. **(04 Marks)**

c. Differentiate between protection and security. **(04 Marks)**

8 a. Explain the different IPC mechanism available in Linux. **(08 Marks)**

b. Explain how process is managed on Linux platform. **(08 Marks)**

c. Write a brief note on the design principles of Linux. **(04 Marks)**

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USN | | | | | | | | | | 10CS54

Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Database Management System

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 typical components module of a DBMS, with a neat diagram. **(10 Marks)**

b. Define the following with examples :
i) Value set ii) Complex attribute iii) Data model iv) Schema construct
v) Metadata. **(10 Marks)**

2 a. What are structural constraints on a relation type? Explain with examples. **(05 Marks)**

b. What is a weak entity type? Explain the role of partial key in design of weak entity type. **(05 Marks)**

c. Design an ER diagram for the mail order Database considering the following requirements. Here employee takes order for parts from customers.
i) The mail order company has employees each identified by a unique employee ID, first and last name, Address, Gender, Zip code.
ii) Each customer of the company is identified by a unique customer ID, first and last name, Address, Location & Zip code.
iii) Each part sold by the company is identified by a unique part number, part name , price & quantity in stock.
iv) Each order placed by a customer taken by an employee and is given a unique order number. Each order contains specified quantities of one or more parts. Each order has a date of receipt as well as an expected ship date. The actual ship date is also recorded.
v) Each customer can place number of orders & each order placed by one customer only.
vi) Each Employee can take any number of orders but each order belongs to only one employee.
vii) Each part placed by number of customers and each customer can place order for number of parts.
viii) Write assumptions made. **(10 Marks)**

3 a. Discuss the entity integrity and referential integrity constraints. Why is each considered important? **(05 Marks)**

b. Discuss the various types of JOIN operations. Why is Theta Join required? **(05 Marks)**

c. Give the schema :
Student (USN, NAME, BRANCH, PERCENTAGE)
Faculty (FID, FNAME, DEPT, DESIGNATION, SALARY)
Course (CID, CNAME, FID)
Enroll (CID, USN, GRADE)
Give the relation algebra expression for the following :
i) Retrieve the name and percentage of all students for the course 10CS54.
ii) List the Departments having a average salary of the faculties above Rs 30,000.
iii) List name of the course having students grade 'A' maximum. **(10 Marks)**

4 a. Explain the different constraints that can be applied during table creation in SQL, with an example. **(08 Marks)**

b. Write the SQL query for the following Database Schema :
Works (Pname, Cname, Salary)
Lives (Pname, Street, City)
Located_in (Cname, City)
Manager (Pname, Mgrname)
i) Find the names of all persons who live in the city "Bangalore".
ii) Retrieve the names of all person of "Infosys" whose salary is between Rs 50,000 and Rs 90,000.
iii) Find the names of all persons who lives and work in same city.
iv) List the names of the people who work for "Tech M" along with the cities they live in.
v) Find the average salary of "Infosys" persons. **(12 Marks)**

PART - B

5 a. Explain the syntax of SELECT statement in SQL. **(04 Marks)**

b. How is view created and dropped? What problems are associated with updating views? **(06 Marks)**

c. Explain the following i) Embedded SQL ii) Database stored procedure. **(10 Marks)**

6 a. What is a functional dependency and who specifies the functional dependency that hold among the attributes of a relation schema? **(05 Marks)**

b. Consider R = {A, B, C, D, E, F}. FDS are {$A \rightarrow BC$, $C \rightarrow E$, $CD \rightarrow EF$}.
Show that $AD \rightarrow F$. **(05 Marks)**

c. Find the key and normalize
Book tittle | Auth_name | Book_type | List_Price | Affiliation | Publication.
FDs are { Book tittle → Book type, Publication
Auth_name → Affiliation
Book_type → List_Price }. **(10 Marks)**

7 a. Which normal form is based on the concept of multi value functional dependency? Explain the same with example. **(10 Marks)**

b. Given relation R with 4 attributes R = (A, B, C, D) and following FDs. Identify the candidate keys for R and highest normal form.
i) $C \rightarrow D$, $C \rightarrow A$, $B \rightarrow C$ ii) $B \rightarrow C$, $D \rightarrow A$. **(10 Marks)**

8 Write short notes on the following :
a. Two phase locking protocol.
b. Transaction support in SQL.
c. Time stamp ordering algorithms.
d. Acid properties. **(20 Marks)**

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USN | | | | | | | | | | **10CS55**

Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015
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. What are the components of data communication system? Explain in brief. **(05 Marks)**
b. With a neat diagram, explain the interaction between layers in the OSI model. **(10 Marks)**
c. What is the difference between a physical and logical address? Explain with example. **(05 Marks)**

2 a. Distinguish between low pass channel and a band pass channel. **(06 Marks)**
b. A network with bandwidth of 10Mbps can pass only an average of 18,000 frames per minute with each frame carrying an average of 10,000 bits. What is the throughput of this network? **(04 Marks)**
c. Compare and contrast between PCM and DM. **(06 Marks)**
d. Explain polar biphase Manchester and differential Manchester encoding schemes with example. **(04 Marks)**

3 a. Explain following modulation techniques:
i) Amplitude modulation
ii) Frequency modulation. **(06 Marks)**
b. A multiplexer combines four 100kbps channels using a time slot of 2 bits. Show the output with four arbitrary inputs. What is the frame rate? What is the frame duration? What is the bit rate? What is the bit duration? **(04 Marks)**
c. With relevant diagrams, explain the data transfer phase in a virtual circuit network. **(10 Marks)**

4 a. Explain CRC error detection method with an example. **(06 Marks)**
b. Explain the structure of encoder and decoder for a Hamming code. **(04 Marks)**
c. What is internet checksum? If a sender needs to send four data items 0×3456, $0 \times ABCC$, $0 \times 02BC$ and $0 \times EEEE$, answer the following:
i) Find the checksum at sender site.
ii) Find the checksum at receiver's site if there is no error. **(10 Marks)**

PART – B

5 a. Explain GO-BACK-N ARQ and selective-repeat-ARQ. List the differences between them. **(10 Marks)**
b. Explain the different frame types in HDLC. **(06 Marks)**
c. Write a short note on piggybacking. **(04 Marks)**

6 a. With a flow diagram, explain the working of CSMA/CD. **(10 Marks)**
b. Explain the following channelization techniques: i) TDMA ii) CDMA. **(10 Marks)**

7 a. What do you mean by hidden and exposed station problems in IEEE 802.11 protocol. Explain in detail. **(06 Marks)**

b. With neat diagram, explain the architecture of Piconet and Scatternet Bluetooth networks. **(06 Marks)**

c. Explain the working of global system for mobile (GSM) in detail. **(08 Marks)**

8 a. Explain IPV_6 header format with its extension headers. **(10 Marks)**

b. Write short note for following:

i) Token passing
ii) Gigabit Ethernet
iii) Polling
iv) FHSS. **(10 Marks)**

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USN | | | | | | | | | | 10CS56

Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015
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 the following with proper examples:
i) Alphabet ii) Powers of an alphabet. **(03 Marks)**

b. Design the DFA's for the following languages:
i) Set of all strings with at least one 'a' and exactly two 'b's on $\Sigma = \{a, b\}$.
ii) Set of all strings such that number of 1's is even and the number of 0's is a multiple of 3 on $\Sigma = \{0, 1\}$. **(08 Marks)**

c. Design an NFA with no more than 5 states for the following language:
$L = \{abab^n \mid n \geq 0\} U \{aba^n \mid n \geq 0\}$ **(03 Marks)**

d. Prove that if $D = (Q_D, \Sigma, \delta_D, \{q_0\}, F_D)$ is the DFA constructed from NFA $N = (Q_N, \Sigma, \delta_N, q_0, F_N)$ by the subset construction, then $L(D) = L(N)$. **(06 Marks)**

2 a. Convert the following $\in$ - NFA into an equivalent DFA: **(05 Marks)**

δ	∈	a	b	c
→p	{q, r}	ϕ	{q}	{r}
*q	ϕ	{p}	{r}	{p, q}
r	ϕ	ϕ	ϕ	ϕ

b. Define regular expression and also write the regular expressions for the following languages:
i) $L = \{w \in \{a, b\}^* \mid w$ has exactly one pair of consecutive a's$\}$.
ii) Set of all strings not ending in substring 'ab' over $\Sigma = \{a, b\}$. **(06 Marks)**

c. Prove that if $L = L(A)$ for some DFA A, then there is a regular expression R such that $L = L(R)$. **(06 Marks)**

d. Obtain the regular expression for the following DFA using state elimination technique: **(03 Marks)**

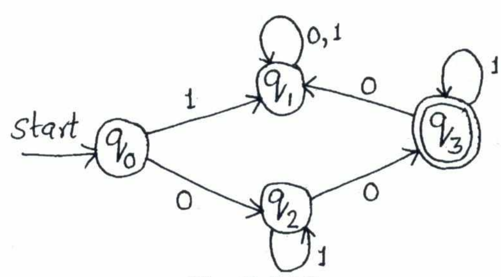

Fig.Q.2(d)

3 a. State and prove pumping lemma for regular languages. **(07 Marks)**

b. Let $\Sigma = \{a, b\}$. Show that the language $L = \{w \in \Sigma^* \mid n_a(w) < n_b(w)\}$ is not regular. **(05 Marks)**

c. Consider the DFA given by the transition table:

δ	a	b
$\rightarrow q_0$	q_1	q_2
q_1	q_1	q_3
q_2	q_1	q_2
q_3	q_1	q_4
$*q_4$	q_1	q_2

i) Draw the table of distinguishabilities for this automaton.
ii) Construct the minimum state equivalent DFA.
iii) Write the language accepted by the DFA. **(08 Marks)**

4 a. Define a Context-Free Grammar (CFG) and also obtain the CFG's for the following languages:
i) $L_1 = \{a^n ww^R b^n \mid w \in \{0,1\}^* \text{ and } n \ge 2\}$
ii) $L_2 = \{a^k b^m c^n \mid m + n = k \text{ and } m, n \ge 1\}$
iii) $L_3 = \{w \in \{a\}^* \mid |w| \bmod 3 \ne |w| \bmod 2\}$. **(10 Marks)**

b. Consider the CFG with productions
$E \rightarrow E * T \mid T$
$T \rightarrow F - T \mid F$
$F \rightarrow (E) \mid 0 \mid 1$
Write the leftmost derivation, rightmost derivation and parse tree for the string '$0 - ((1 * 0) - 0)$'. **(06 Marks)**

c. Show that the following grammar is ambiguous:
$S \rightarrow SbS$
$S \rightarrow a$. **(04 Marks)**

PART – B

5 a. Design a PDA for the following language : $L = \{ww^R \mid w \in \{a,b\}+\}$. Also, draw the transition diagram for the constructed PDA. Write the instantaneous description (ID) for the string 'abbbba'. **(08 Marks)**

b. Convert the following CFG to a PDA that accepts the same language by empty stack:
$E \rightarrow E + E \mid E * E \mid (E) \mid I$
$I \rightarrow Ia \mid Ib \mid I0 \mid I1 \mid a \mid b$ **(05 Marks)**

c. Define a deterministic PDA (DPDA). Also, design a DPDA along with transition diagram for the following language: $L = \{a^n b^{2n} \mid n \ge 0\}$. **(07 Marks)**

6 a. Begin with the grammar
$S \rightarrow aAa \mid bBb \mid \in$
$A \rightarrow C \mid a$
$B \rightarrow C \mid b$
$C \rightarrow CDE \mid \in$
$D \rightarrow A \mid B \mid ab$

i) Eliminate $\in$-productions.
ii) Eliminate any unit productions in the resulting grammar.
iii) Eliminate any useless symbols in the resulting grammar. **(08 Marks)**

b. Define Chomsky Normal Form (CNF). Also, convert the following CFG to CNF:

$S \rightarrow AB \mid a$

$A \rightarrow aab$

$B \rightarrow Ac$. **(06 Marks)**

c. Show that the language $L = \{x \in \{0, 1)^* \mid |x| \text{ is a perfect square }\}$ is not context-free. **(06 Marks)**

7 a. Define a Turing machine. Also, design a Turing machine to accept the set of all palindromes over $\{0, 1\}^*$. Write the transition diagram for the constructed Turing machine and write the sequence of ID's for the input string '1001'. **(12 Marks)**

b. Explain multitape Turing machine and non-deterministic Turing machines with neat block diagrams. **(08 Marks)**

8 Write short notes on the following topics:

a. Applications of finite automata in text search.
b. Inherent ambiguity of context-free languages.
c. Post's correspondence problem.
d. Recursive language and it's relationship with RE and non-RE languages. **(20 Marks)**

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