

Fifth Semester B.E. Degree Examination, May/June 2010
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 key challenges facing software engineering? Explain. (04 Marks)
b. What are emergent system properties? Give examples for each. (04 Marks)
c. With a figure, explain the requirements of an engineering process. (12 Marks)
- 2 a. With a figure, explain the phases in the RUP. (05 Marks)
b. Explain the functional and non-functional requirements for any system. (10 Marks)
c. Give the number of possible metrics to specify non-functional system properties. (05 Marks)
- 3 a. What is an architectural design? Explain the architectural design decisions. (06 Marks)
b. Why requirements need to be validated? Explain the check made in requirement validation. (06 Marks)
c. Explain the requirement elicitation and analysis phase, with spiral diagram. Give reasons, why is it difficult phase in requirements engineering process. (08 Marks)
- 4 a. Explain the IEEE standard format for the requirement document in detail. (06 Marks)
b. Draw and explain the use-case diagram and sequence diagram for a library system or ATM withdraw system. (06 Marks)
c. Refer table below for task durations and interdependencies:

Task	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	T ₈	T ₉	T ₁₀
Duration in days	9	16	11	15	7	20	26	15	15	16
Interdependencies	-	-	-	T ₁ (M ₁)	T ₁ T ₂ (M ₂)	T ₂ T ₃ (M ₃)	T ₃ (M ₅)	T ₄ T ₅ (M ₄)	T ₅ T ₆ (M ₆)	T ₈ (M ₇)

- i) Draw activity network
- ii) Find and highlight critical path. (08 Marks)

PART – B

- 5 a. Name and explain the three organizational styles that are very widely used, with necessary figure. (10 Marks)
b. Explain with a figure, the central control and event based control system. (10 Marks)
- 6 a. What are agile methods? Discuss the principles of agile methods. (07 Marks)
b. What are the practices followed in extreme programming? (06 Marks)
c. With a figure, explain the process of prototype development. What are the benefits of using prototyping? (07 Marks)
- 7 a. What is verification and validation? Explain why validation is a particularly difficult process. (05 Marks)
b. Explain the software development process model, using V-model with figure. (10 Marks)
c. The clean room approach to software development is based on five key strategies. Explain them. (05 Marks)
- 8 a. Name and explain the factors governing staff selection. (10 Marks)
b. Explain with a figure, the people capability maturity model. (10 Marks)

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Fifth Semester B.E. Degree Examination, May/June 2010
Systems Software

Time: 3 hrs.

Max. Marks:100

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

PART - A

- 1 a. List out registers used in SIC machine architecture along with their use. (07 Marks)
 b. Write a sequence of instructions for SIC/XE to set ALPHA equal to GAMMA* BEETA - 9. (Use register operation). (05 Marks)
 c. Write a program in both SIC and SIC/XE to copy a character string 'System Software' to another character string. (08 Marks)
- 2 a. Define the following with an example : i) Operation code table ii) Symbol table. (06 Marks)
 b. Generate the complete object program for the following assembly level program with the symbol table. Assume : (14 Marks)
- | | | | |
|------------|----------|-----------|-----------|
| CLEAR = B4 | LDT = 74 | TD = E0 | JEQ = 30 |
| TIXR = B8 | JLT = 38 | RSUB = 4C | LDCH = 50 |
| WD = DC | X = 1 | T = 5 | |
- | | | |
|--------|-------|-----------|
| WRREC | START | 105D |
| | CLEAR | X |
| | LDT | LENGTH |
| WLOOP | TD | OUTPUT |
| | JEQ | WLOOP |
| | LDCH | BUFFER, X |
| | WD | OUTPUT |
| | TIXR | T |
| | JLT | WLOOP |
| | RSUB | |
| OUTPUT | BYTE | X '05' |
| BUFFER | RESB | 400 |
| LENGTH | RESB | 2 |
| | END | WRREC |
- 3 a. Describe how the assembler handles literal operands. (06 Marks)
 b. Give the format for DEFINE and REFER records. (06 Marks)
 c. Explain load and go assembler, with an example. (08 Marks)
- 4 a. With the help of an example, show how relocation and linking operations are performed. (12 Marks)
 b. Enlist any four different loader option commands. (04 Marks)
 c. Define the following : i) Linking loader ii) Dynamic linking. (04 Marks)

PART - B

- 5 a. List the important four tasks to be accomplished by a text editor for an interactive user computer dialogue. (04 Marks)
- b. Discuss three basic types of computing environments for editors. (06 Marks)
- c. Define tracing and trace back in debugging functions. (04 Marks)
- d. Write a note on the concept of user interface criteria in a text editor. (06 Marks)
- 6 a. Write an algorithm for one pass macro processor. (10 Marks)
- b. RDBUFF HACRO & INDEV, & BUFADR, & RECLTH, & EOR (10 Marks)

```

& EORCT   SET      %N ITEMS ( & EOR)
          CLEAR   X
          CLEAR   A
          + LDT   # 4096
$ LOOP    TD      = X '& INDEV'
          JEQ     $ LOOP
          RD      = X '& INDEV'
& CTR     SET      1
          WHILE  ( & CTR LE & EORCT )
          COMP   = X '0000 & EOR [& CTR]'
          JEQ    $EXIT
& CTR     SET      & CTR + 1
          END W
          STCH   & BUFADR, X
          TIXR  T
          JLT   $ LOOP
$ EXIT    STX     & RECLTH
          MEND

```

Expand the following macro invocation statements using the above given macro.

- i) RDBUFF F1, BUFFER, Length, (04, 12)
- ii) RDBUFF F1, BUFFER, Length

- 7 a. Write a note on ANSI C macro language. (05 Marks)
- b. Explain the following regular expressions with examples : (08 Marks)
- i) [] ii) { } iii) / iv) ()
- c. Explain various sections of a LEX specification using a basic word count program by reading from a file. (07 Marks)
- 8 a. Define YACC tools. What are the two types of conflicts in YACC? Give examples. (08 Marks)
- b. Write YACC program to validate a simple arithmetic expression involving operators +, -, *, /. (08 Marks)
- c. Define and explain the use of YY wva p(). (04 Marks)

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Fifth Semester B.E. Degree Examination, May/June 2010
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. Explain the following terms :
 - i) Bootstrap program ii) Caching iii) Trap
 - iv) Job pool v) Symmetric multiprocessing. (10 Marks)
- b. Explain two sets of operating system services that are helpful to user as well as efficient operation of system. (05 Marks)
- c. Write and explain the sequence of system calls for copying a file to another (new) file. (05 Marks)
- 2 a. What is PCB? Enumerate and explain various fields in PCB. (04 Marks)
- b. What is multithreading? Explain the benefits of multithreaded programming. (05 Marks)
- c. Consider the following set of processes :

Process	Arrival time	Burst time
P ₁	0	1
P ₂	1	9
P ₃	2	1
P ₄	3	9

- i) Draw Gantt charts showing the execution of these processes using FCFS, preemptive SJF, non-preemptive SJF and RR (Quantum – 1) scheduling schemes.
- ii) Compute the turn around time and waiting time for each process for each of the schemes above.
- iii) Compute the average turn around time and average waiting time in each scheme and thus find the best scheme in this particular case. (11 Marks)
- 3 a. Define race condition. List the requirements that a solution to critical section problem must satisfy. (05 Marks)
- b. What are semaphores? Explain two primitive semaphore operations. What are the advantages of semaphore? (07 Marks)
- c. Define the algorithms TestAndSet () and swap (). Show that they satisfy mutual exclusion. (08 Marks)
- 4 a. Explain how resource-allocation graph is used to describe deadlocks. (05 Marks)
- b. What are the different methods for handling deadlocks? Explain Banker's algorithm. (11 Marks)
- c. "A safe state is not a deadlock state but a deadlock state is an unsafe state". Explain. (04 Marks)

PART – B

- 5 a. What do you mean by dynamic storage allocation problem? Explain possible solutions to this problem. (04 Marks)
- b. Explain the concept of forward-mapped page table. (04 Marks)
- c. Consider the following reference string : 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. Assuming three frames, all initially empty, how many page faults would occur for :
 - i) LRU ii) FIFO iii) Optimal page replacement algorithms? Which of the algorithms is most efficient in this case? (12 Marks)

- 6 a. What is meant by 'consistency semantics'? Explain the consistency semantics as implemented in a modern O. S. (07 Marks)
- b. With the help of a neat diagram, describe :
- i) Tree –structured directory (08 Marks)
 - ii) Acyclic – graph directory. (05 Marks)
- c. Explain virtual file system(VFS). (05 Marks)
- 7 a. Suppose the position of cylinder is at 53. Sketch the graphical representation for the queue of pending requests in the order – 98, 183, 37, 122, 14, 124, 65, 67 for FCFS, SSTF and LOOK scheduling schemes. Give your comment on this scenario for the above schemes. (12 Marks)
- b. Describe the access matrix model used for protection in a computer system. (08 Marks)
- 8 Write short notes on :
- a. Components of Linux system
 - b. Processes and threads
 - c. Conflict resolution mechanism of Linux
 - d. Linux file system. (20 Marks)

Fifth Semester B.E. Degree Examination, May/June 2010
Database Management 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. Briefly discuss the advantages of using the DBMS. (10 Marks)
 b. Explain the component modules of DBMS and their interaction, with the help of a diagram. (10 Marks)
- 2 a. Define an entity and an attribute. Explain the different types of attributes that occur in an ER model, with an example. (10 Marks)
 b. Define the following with an example: (10 Marks)
 - i) Weak entity type
 - ii) Participation constraints
 - iii) Cardinality ratio
 - iv) Ternary relationship
 - v) Recursive relationship.
- 3 a. Discuss the characteristics of a relation, with examples. (08 Marks)
 b. Briefly discuss the different types of update operations on relational database. Show an example of a violation of the referential integrity in each of the update operation. (09 Marks)
 c. What is a valid state and an invalid state, with respect to a database? (03 Marks)
- 4 a. Consider the following two tables T₁ and T₂. Show the results of the following operations: (10 Marks)
 - i) $T_1 \bowtie_{T_1.P=T_2.A} T_2$
 - ii) $T_1 \bowtie_{T_1.Q=T_2.B} T_2$
 - iii) $T_1 \bowtie_{T_1.P=T_2.A} T_2$
 - iv) $T_1 \bowtie_{(T_1.P=T_2.A \text{ AND } T_1.R=T_2.C)} T_2$
 - v) $T_1 \cup T_2$.

(Assume T₁ and T₂ are union compatible).

Table T ₁			Table T ₂		
P	Q	R	A	B	C
10	a	5	10	b	6
15	b	8	25	c	3
25	a	6	10	b	5

- b. Explain with an example, the basic constraints that can be specified, when you create a table in SQL. (10 Marks)

PART – B

- 5 a. Explain the syntax of a SELECT statement in SQL. Write the SQL query for the following relation algebra expression.
 $\pi_{Bdate, Address}(\sigma_{Fname='John' \wedge Minit='B' \wedge Lname='Smith'}(EMPLOYEE))$
 (06 Marks)
- b. Explain DROP command with an example. (04 Marks)
- c. Consider the following tables:
 WORKS (Pname, Cname, Salary)
 LIVES (Pname, Street, City)
 LOCATED-IN (Cname, City)
 MANAGER (Pname, mgrname)
 Write the SQL query for the following:
- Find the names of all persons who live in the city 'Mumbai'.
 - Retrieve the names of all person of 'Infosis' whose salary is between Rs.30,000 and Rs.50,000.
 - Find the names of all persons who live and work in the same city.
 - List the names of the people who work for 'Wipro' along with the cities they live in.
 - Find the average salary of all 'Infosians'.
- (10 Marks)
- 6 a. What is a functional dependency? Write an algorithm to find a minimal cover for a set of functional dependencies. (10 Marks)
- b. What is the need for normalization? Explain second normal form. Consider the relation EMP-PROJ = {SSn, Pnumber, Hours, Ename, Pname, Plocation}. Assume {SSn, Pnumber} as primary key. The dependencies are
 $SSn \ Pnumber \rightarrow \{Hours\}$
 $SSn \rightarrow \{Ename\}$
 $Pnumber \rightarrow \{Pname, Plocation\}$
 Normalize the above relation into 2NF. (10 Marks)
- 7 a. Explain multivalued dependency and fourth normal form, with an example. (10 Marks)
- b. Let $R = \{SSn, Ename, Pnumber, Pname, Plocation, Hours\}$ and $D = \{R_1, R_2, R_3\}$, where
 $R_1 = EMP = \{SSn, Ename\}$
 $R_2 = PROJ = \{Pnumber, Pname, Plocation\}$
 $R_3 = WORK-ON = \{SSn, Pnumber, Hours\}$.
 The following functional dependencies hold on relation R.
 $F = \{SSn \rightarrow Ename ;$
 $\quad Pnumber \rightarrow \{Pname, Plocation\};$
 $\quad \{SSn, Pnumber\} \rightarrow Hours\}$.
 Prove that the above decomposition of relation R has the lossless join property. (10 Marks)
- 8 a. Explain the problems that can occur when concurrent transactions are executed. Give examples. (10 Marks)
- b. Briefly discuss the two phase locking protocol used in concurrency control. (10 Marks)

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Fifth Semester B.E. Degree Examination, May/June 2010
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. What is data communication? What are its characteristics and components? Explain. (06 Marks)
- b. Give the comparison between LAN, MAN and WAN, with an example. (06 Marks)
- c. Describe with a neat diagram, the functionalities of each layer in the TCP/IP model. (08 Marks)
- 2 a. Explain the transmission modes. (06 Marks)
- b. We want to digitalize the human voice. What is the bit rate, assuming 8 bits per sample? (04 Marks)
- c. Discuss 8 B/10 B coding scheme. (04 Marks)
- d. Explain the delta modulation. (06 Marks)
- 3 a. An analog signal has a bit rate of 8000 bps and a baud rate of 1000 baud. How many data elements are carried by each signal element? How many signal elements do we need? (04 Marks)
- b. Define synchronous TDM. (12 Marks)
- c. Explain the amplitude modulation. (04 Marks)
- 4 a. Briefly explain twisted pair cable and optical fibre cable, with their applications. (10 Marks)
- b. Explain the check sum, with an example. (06 Marks)
- c. Explain the types of error. (04 Marks)

PART – B

- 5 a. Explain the selective repeat and stop and wait ARQ. (10 Marks)
- b. Discuss HDLC protocol. (10 Marks)
- 6 a. Explain: i) CSMA ii) CSMA/CD. (10 Marks)
- b. What do you mean by channelization? Explain the protocols used for channelization. (10 Marks)
- 7 a. Explain the IEEE 802.11 architecture. (08 Marks)
- b. How does a virtual LAN helpful in providing (security and reduce the network traffic)? (08 Marks)
- c. Explain the bridges. (04 Marks)
- 8 a. Explain the SONET/ SDH layers and frames. (12 Marks)
- b. Find the data rate and duration of an STS-1 signal. (04 Marks)
- c. Explain the AMPS. (04 Marks)

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Fifth Semester B.E. Degree Examination, May/June 2010
Formal Languages and Automata Theory

Time: 3 hrs.

Max. Marks:100

Note: Answer any 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) Powerset iv) Language. (08 Marks)
 b. Mention the differences between DFA, NFA and ϵ -NFA. (04 Marks)
 c. Convert the following ϵ -NFA to DFA. [Refer Fig.Q1(c)]. (08 Marks)

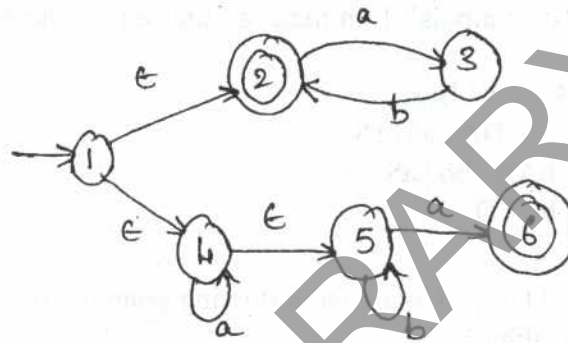


Fig.Q1(c)

- 2 a. Define a regular expression. Find regular expression for the following languages on $\{a, b\}$:
 i) $L = \{a^{2n} b^{2m} : n \geq 0, m \geq 0\}$ ii) $L = \{w : |w| \bmod 3 = 0\}, w \in \{a, b\}^*$ (08 Marks)
 b. Prove that if L and M are regular languages, then so is $L \cap M$. (06 Marks)
 c. Convert the regular expression $(01 + 1)$ to an ϵ -NFA. (06 Marks)
- 3 a. State pumping lemma for regular languages. Prove that the language $\{a^n b^n \mid n \geq 1\}$ is non-regular. (10 Marks)
 b. Define distinguishable and indistinguishable states. Minimize the following DFA using table filling algorithm.

	f	0	1
\rightarrow A	B	F	
B	G	C	
*	C	A	C
D	C	G	
E	H	F	
F	C	G	
G	G	E	
H	G	C	

(10 Marks)

- 4 a. Define CFG. Obtain CFG for the following languages:
 i) $L = \{ww^R \mid w \in \{a, b\}^*\}$, w^R is the reversal of w ii) $L = \{w : w \text{ has a substring } ab\}$ (10 Marks)
 b. What is an ambiguous grammar? Show that the following grammar is ambiguous.
 $E \rightarrow E + E \mid E - E \mid E * E \mid E / E \mid (E) \mid a$
 where E is the start symbol. Find the unambiguous grammar. (10 Marks)

PART – B

- 5 a. Define PDA. Design PDA to accept the following language by final state.
 $L = \{ w \mid w \in \{a, b\}^*, N_a(w) = N_b(w) \}$
 Draw the graphical representation of PDA. Also, show the moves made by the PDA for the string abbaba. (12 Marks)
- b. Convert the following CFG to PDA.
 $S \rightarrow aABB \mid aAA$
 $A \rightarrow aBB \mid a$
 $B \rightarrow bBB \mid A$
 $C \rightarrow a$ (08 Marks)
- 6 a. What are useless symbols? Eliminate ϵ , unit and useless productions from the following grammar:
 $S \rightarrow AaA \mid CA \mid BaB$
 $A \rightarrow aaBa \mid CDA \mid aa \mid DC$
 $B \rightarrow bB \mid bAB \mid bb \mid aS$
 $C \rightarrow Ca \mid bC \mid D$
 $D \rightarrow bD \mid \epsilon$ (10 Marks)
- b. What is CNF and GNF? Obtain the following grammar in CNF:
 $S \rightarrow aBa \mid abba$
 $A \rightarrow ab \mid AA$
 $B \rightarrow aB \mid a$ (10 Marks)
- 7 a. Prove that the context free languages are closed under union, concatenation and reversal. (10 Marks)
- b. Design a turning machine that performs the following function:
 $q_0 w \vdash^* q_f ww$ for any $w \in \{1\}^*$ (10 Marks)
- 8 Write short notes on:
 a. Multitape TM
 b. Post correspondence problem
 c. Chomsky hierarchy
 d. Applications of regular expressions. (20 Marks)
