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Fifth Semester B.E. Degree Examination, December 2011
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? Explain the essential attributes of a good software.   (05 Marks)
     b.   List and explain any five software engineering code of ethics and professional practices.
                                                                                          (05 Marks)
     c.   Describe briefly the phases of the system engineering process, with a neat diagram.(10 Marks)

2   a.   Define critical systems. Explain the four principle dimensions of system dependability.
                                                                                          (05 Marks)
     b.   Briefly discuss the reliability terminologies and mention the approaches to system reliability
          enhancement.   (05 Marks)
     c.   What is software process? With a neat diagram, explain the software design process
          activities, in detail.   (10 Marks)

3   a.   What are the different metrics for specifying non-functional requirements? Explain any two
          of them.   (05 Marks)
     b.   Write the IEEE standard format for requirement document.   (05 Marks)
     c.   Give reasons why requirement elicitation and analysis is a difficult phase in requirements
          engineering process.   (05 Marks)
     d.   What are volatile requirements? Briefly discuss the classification of volatile requirements.
                                                                                          (05 Marks)

4   a.   Draw and explain the sequence diagram for ATM system.   (08 Marks)
     b.   Mention the weaknesses of structured methods when used to produce system models.
                                                                                          (04 Marks)
     c.   Explain the risk management process, with a neat diagram.   (08 Marks)

PART – B

5   a.   Define architectural design. With an example, describe the repository model and give its
          advantages and disadvantages.   (08 Marks)
     b.   Briefly discuss the architectural design decisions.   (06 Marks)
     c.   Draw and explain the state diagram for weather station system.   (06 Marks)

6   a.   What is pair programming? Highlight its advantages.   (04 Marks)
     b.   Explain with a diagram, rapid application development environment.   (06 Marks)
     c.   Explain the activities involved in reengineering process, with an illustrative figure.(10 Marks)

7   a.   Briefly discuss some of the automated static analysis checks.   (05 Marks)
     b.   Explain the five key strategies of clean room software development.   (05 Marks)
     c.   What is test automation? Explain with figure the tools that might be included in a testing
          workbench.   (10 Marks)

8   a.   Name and explain any five factors governing staff selection.   (05 Marks)
     b.   Briefly discuss the advantages and disadvantages of group cohesiveness that influence group
          working.   (05 Marks)
     c.   Explain in detail algorithmic cost models in project planning.   (10 Marks)

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Fifth Semester B.E. Degree Examination, December 2011
Systems Software

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 system software? Compare system software with application software and give couple of examples. **(04 Marks)**
    b. Explain the instruction formats and addressing modes of SIC/XE machine architecture. **(10 Marks)**
    c. Suppose the ALPHA is an array of 100 words. Write a sequence of instructions for SIC/XE to set all 100 elements of the array to ZERO. Use immediate addressing and register to register addressing to make the process as efficient as possible. **(06 Marks)**

2   a. What are the fundamental functions that any assembler must perform? With a suitable example, explain any six assembler directives. **(10 Marks)**
    b. Write an algorithm for PASS-1 of two pass assembler and explain with an example. **(10 Marks)**

3   a. What is literal? What are differences between literal and immediate operand. **(04 Marks)**
    b. What are program blocks? With a suitable example, explain how program blocks are handled by an assembler. **(06 Marks)**
    c. Give the format of the following records necessary to obtain object code :
       i) Define record   ii) Refer record   iii) Modification record (revised) **(10 Marks)**

4   a. What is loader? What are the basic functions the loader has to perform? **(04 Marks)**
    b. What is relocation? Explain the methods for specifying relocation as a part of object program. **(08 Marks)**
    c. Explain the working of linkage editor and linking loader. **(08 Marks)**

PART – B

5   a. Explain the different tasks to be accomplished b a text editor for an interactive user computer dialogue. **(10 Marks)**
    b. With a neat diagram, explain the working of a typical editor structure. **(10 Marks)**

6   a. What is MACRO? Briefly discuss various data structures required for a design of MACRO PROCESSOR. **(08 Marks)**
    b. With regard to machine independent macroprocessor feature, explain the followings :
       i) Concatenation of MACRO parameters   ii) Generation of unique labels
       iii) Conditional MACRO expansion   iv) Keyword macro parameters. **(12 Marks)**

7   a. Discuss the characters that used in the meta language as part of standard ASCII character set used in UNIX operating system. **(08 Marks)**
    b. What is LEX? Explain the LEX specification format. **(06 Marks)**
    c. Write a LEX program to identify the decimal number. **(06 Marks)**

8   a. What is YACC? Explain the different sections used in writing the YACC specification. **(10 Marks)**
    b. Write a YACC program to function as a calculator which performs addition, subtraction multiplication, division and unary operations. **(10 Marks)**

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Fifth Semester B.E. Degree Examination, December 2011
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. List the operating system responsibilities in connection, with a process management and memory management.   **(08 Marks)**
    b. Explain the 'graceful degradation' and 'fault tolerant' in a multiprocessor system. **(06 Marks)**
    c. What is a 'virtual machine'? Explain the just–in–time (JIT) compiler, used in a java virtual machine.   **(06 Marks)**

2   a. Explain the process state, with the suitable diagram.   **(08 Marks)**
    b. Explain the benefits of multithreaded programming.   **(08 Marks)**
    c. Explain the hard real time system.   **(04 Marks)**

3   a. Define test and set instruction and implement mutual exclusion, using test and set. **(05 Marks)**
    b. Sleeping – barber and sleeping – customers problem: **(15 Marks)**

     A barbershop consists of a waiting room with 'N' chairs (chair [1], chair [2],....chair [n]) as shown in Fig. Q.3(b) and the barber room containing the barber chair (chair [0]). If there are no customers to be served, the barber goes to sleep. If a customer enters the barbershop and all the chairs are occupied, then the new customer goes to sleep. If the barber in busy, but the waiting chairs are available, then the new customer occupies the next free chair to maintain the queue. If the barber in asleep, the customer wakes up the barber and occupies the barber chair.

     Assume chair [0] in one of the critical regions and all waiting chairs together are another critical region. Also assume only the following abstract functions are available:

     i) Haircut ( ) ;
         // barber busy in his work.
     ii) Customers – shift – to – next – chair ( ) ;
         // after haircut the customer gets up from the barber chair and all other customers shift by one position to the next chair towards the barber chair.
     iii) Customer – occupies – free – chair ( ) ;
         // new customer occupies the next free chair to maintain the queue, or, if no customers are waiting then new customer directly occupies the barber chair.

     Write an abstract C program to coordinate the barber and customers in sleeping – barber and sleeping – customer problem, using semaphores with atomic operations wait ( ) and signal ( ). Assume suitable data structures for abstract implementation.
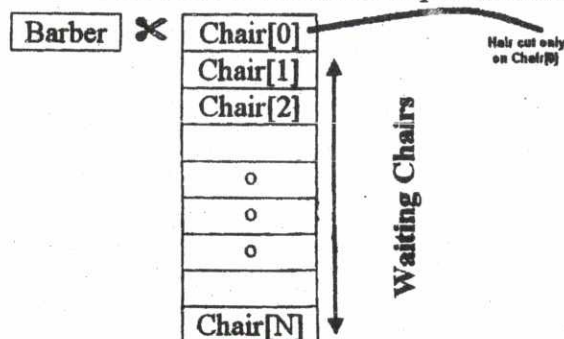

Fig. Q.3(b)

4 a. List any four examples of deadlock that are not related to computer systems. (08 Marks)
   b. Explain the safety algorithm used in Banker's algorithm, with suitable data structures.
   (12 Marks)

PART – B

5 a. What is dynamic storage allocation? Explain the commonly used strategies for dynamic storage allocation. (12 Marks)
   b. Explain the buddy – system, used for managing free memory assigned to kernel process.
   (08 Marks)

6 a. List the common file types along with its extensions and functions. (10 Marks)
   b. How do the modern operating systems concurrently support multiple types of file system? Explain its implementation, in detail. (10 Marks)

7 a. Explain sector slipping, with an example. (04 Marks)
   b. Assume the disk queue, with request fun I/O to block on cylinders as 80, 30, 15, 100, 125, 90, 45, and 10. If the disk head is initially at cylinder 35, illustrate the disk movements, using the SSTF scheduling algorithm. Also calculate the total head movement. (08 Marks)
   c. Explain the various questions that arise in revocation of access rights. (08 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 the block structure. (12 Marks)

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Fifth Semester B.E. Degree Examination, December 2011

Database Management Systems

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, selecting*
at least TWO questions from each part.
2. *For SQL and relational algebra queries refer*
appropriate tables given at the end of paper.

PART – A

1 a. Discuss the various component modules of a DBMS with a neat diagram. **(08 Marks)**
   b. Briefly explain the advantages of object oriented systems. **(05 Marks)**
   c. List and explain the main characteristics of database approach. **(07 Marks)**

2 a. Define and explain a partial key, with an example. **(04 Marks)**
   b. What is meant by recursive relationship? Bring out the importance of role names in recursive relationship, with an example. **(06 Marks)**
   c. Design an ER diagram for maintaining a movie database taking into account atleast four entities. **(10 Marks)**

3 a. Explain foreign key and its importance. Can a foreign key exist, only for a single table? Explain. **(05 Marks)**
   b. How can an intersection operator be implemented using union and minus operator? **(03 Marks)**
   c. Write queries in relational algebra for the following :
      i)   Retrieve the number of dependents for an employee named "Ram"
      ii) Retrieve the name of managers working in location named "XYZ" who has no female dependents.
      iii) Retrieve the name of employee who works in the same department as that of "Raj". **(12 Marks)**

4 a. Explain all possible options that can be specified when a referential integrity constraint is violated using suitable example for all options. **(08 Marks)**
   b. Write queries in SQL for the following. Refer the relations at the end of the question paper :
      i)   Retrieve the name of the employee who gets second highest salary
      ii) For each department that has more than five employees, retrieve the department number and the number of its employees who have salary more than Rs.5000.
      iii) Retrieve the name of employees whose salary is greater than all the employees working in either department 5 or 6. **(12 Marks)**

PART – B

5 a. Discuss the significance of an assertion. Write an assertion to specify a constraint such that the salary of an employee must not be greater than the salary of the manager of the department that the employee works for in SQL. **(08 Marks)**
   b. What is meant by impedance mismatch? Explain. **(06 Marks)**
   c. Create a view which will display the department name, number of employees working and total salary for each department. **(06 Marks)**

6 a. Suggest and explain three different techniques to achieve 1NF using a suitable example.
                                                                                    (08 Marks)
   b. Differentiate between prime and non-prime attribute, with an example.   **(04 Marks)**
   c. Consider the relation R(A, B, C, D, E, F) and the FD $A \rightarrow B, C \rightarrow DF, AC \rightarrow E, D \rightarrow F$.
       What is the key and highest normal form of R? If it is not in 3NF find a decomposition that
       is lossless and dependency preserving?   **(08 Marks)**

7 a. Which normal form is based on the concept of multi valued functional dependency? Explain
       the same with an example.   **(10 Marks)**
   b. Explain two phase locking protocol and its disadvantages.   **(10 Marks)**

8   Write short notes on :
   a. Tune stamp ordering algorithm
   b. ARIES algorithm
   c. Embedded SQL
   d. Fifth normal form.   **(20 Marks)**

   Tables/Relations :
   Employee (Name, SSN, Salary, Super SSN, DNo)
   Department (DNum, DName, Mgr SSN)
   Dept-Locations (DNum, Dlocation)
   Work ON (ESSN, PNo, Hours)
   Dependent (ESSN, Dep Name, Sex)

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Fifth Semester B.E. Degree Examination, December 2011
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? Explain the fundamental characteristics on which effectiveness of data communication depends. **(06 Marks)**
   b. Differentiate between LAN, WAN and MAN. **(04 Marks)**
   c. Explain the OSI reference model for computer networks. **(10 Marks)**

2 a. What are the factors on which data rate depends in data communications? **(04 Marks)**
   b. Explain the different causes for transmission impairments during signal transmission through media. **(06 Marks)**
   c. Explain with a neat diagram, the components of a PCM encoder. **(10 Marks)**

3 a. With the help of a neat diagram, explain the ASK, FSK and PSK. Discuss the bandwidth requirement in each case. **(10 Marks)**
   b. What is spread spectrum? Explain the following techniques for spread spectrum: FHSS and DSSS. **(10 Marks)**

4 a. Explain the principles of optical fiber communication. Discuss the advantages and disadvantages of optical fibers. **(06 Marks)**
   b. Obtain the CRC code word using generator polynomial $g(x) = x^3 + x + 1$, for the data [1001]. Give the hardware realization of CRC divisor. **(08 Marks)**
   c. With the help of an example, explain the computation of internet checksum. Explain how the error detection is done, using internet checksum. **(06 Marks)**

PART – B

5 a. Explain with the help of examples, the concepts of bit stuffing and byte stuffing. **(04 Marks)**
   b. Explain step and wait ARQ protocol, with the help of a neat diagram. **(06 Marks)**
   c. Explain the frame formats and control fields for different types of HDLC frames. **(10 Marks)**

6 a. An ALOHA network transmits 200 bit frame on a shared channel of 200 kbps. If the system produces 1000 frames per second, obtain the throughput. **(06 Marks)**
   b. What is CSMA? Explain the different persistence methods of CSMA. **(06 Marks)**
   c. Explain the 802.3 MAC frame format. **(08 Marks)**

7 a. Explain the different types of addressing mechanisms in IEEE 802.11. **(10 Marks)**
   b. Write short notes on: i) TDD TDMA   ii) Virtual LAN. **(10 Marks)**

8 a. Explain w.r.t SONET, the following:
      i) SONET layers   ii) SONET frame format   iii) STS multiplexing. **(12 Marks)**
   b. Explain w.r.t ATM, the following:
      i) ATM network architecture   ii) ATM frame formats. **(08 Marks)**

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Fifth Semester B.E. Degree Examination, December 2011
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 finite automata. What are the applications of finite automation? **(06 Marks)**
   b. What are the difference between DFA and NFA? **(04 Marks)**
   c. Design a DFA which accept strings of 0's and 1's which when interpreted as a binary integer is multiple of 5. Also give the sequence of states that DFA is in while processing the input string : 1001011. **(10 Marks)**

2 a. Obtain the regular expression to accept strings of a's, b's and c's such that fourth symbol from the right is : a and ends with : b. **(04 Marks)**
   b. Consider the following ε-NFA :

Fig.Q2(b)

   i)   Compute ε-Closure of each state
   ii) Convert the automaton to a DFA. **(10 Marks)**
   c. Convert the following automaton to a regular expression using state elimination technique :

Fig.Q2(c)

   (06 Marks)

3 a. Prove that the language $L = \left\{ 0^m 1^n \mid m > n, \Sigma = \{0, 1\} \right\}$ is not regular. **(06 Marks)**
   b. Consider the DFA given by the transition diagram :

Fig.Q3(b)

   i)   Draw the table of distinguishabilities for this automaton.
   ii) Construct the minimum state equivalent DFA. **(10 Marks)**
   c. Show that if L is regular language, then complement of L denoted by $\overline{L}$ is also regular. **(04 Marks)**

4 a. Define context-free grammar. Obtain the CFG for the following languages :

i) $L = \left\{ w \mid w \in \{0,1\}^* \text{ with at least one occurrence of '101'} \right\}$

ii) $L = \left\{ a^i b^j c^k \mid i = j + k, \Sigma = \{a, b, c\} \right\}$ (08 Marks)

b. Explain the following with suitable examples :
i) Left most derivation   ii) Right most derivation   iii) Parse tree (06 Marks)

c. What is an ambiguous grammar? Show that grammar shown below is ambiguous.

$S \rightarrow AB \mid aaB$
$A \rightarrow Aa \mid a$
$B \rightarrow b$ (06 Marks)

PART – B

5 a. What is an instantaneous description of PDA? Obtain a PDA to accept the following language by final state :

$L = \left\{ a^n b^{2n} \mid n \geq 1, \Sigma = \{a, b\} \right\}$

Draw the transition diagram for PAD. Also, show the moves made by PDA for the string : aabbbb. (12 Marks)

b. Design a PDA for the following CFG :
$S \rightarrow aSb \mid bSa \mid SS \mid \in$ (08 Marks)

6 a. What is an unit production? Begin with the grammar :

$S \rightarrow ABC \mid BaB$
$A \rightarrow aA \mid BaC \mid aaa$
$B \rightarrow bBb \mid a \mid D$
$C \rightarrow CA \mid AC$
$D \rightarrow \in$

i) Eliminate $\in$-productions
ii) Eliminate any unit productions in the resulting grammar
iii) Eliminate any useless symbols in the resulting grammar. (10 Marks)

b. Obtain the following grammar in CNF.
$S \rightarrow 0A \mid 1B$
$A \rightarrow 0AA \mid 1S \mid 1$
$B \rightarrow 1BB \mid 0S \mid 0$ (10 Marks)

7 a. Define a Turing machine. Explain how the Turing machine would be designed to simulate a computer. (08 Marks)

b. Design a Turing machine to accept the set of all palindromes over $\{0, 1\}^*$. Also, indicate the moves made by Turing machine for the string : 1001. (12 Marks)

8   Write short notes on :
a. Universal machine
b. Post correspondence problem
c. Halting problem of TM
d. Recursive languages. (20 Marks)

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