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Fifth Semester B.E. Degree Examination, Dec.09/Jan.10

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 attributes of a good software? Explain. (06 Marks)
- b. Mention the different stages in a system development. Explain any four phases. (10 Marks)
- c. Define and distinguish between the system reliability and availability. (04 Marks)
- 2 a. What is process iteration? Explain Boehm's spiral model. (10 Marks)
- b. With an example, explain the functional and non-functional requirements. (10 Marks)
- 3 a. Explain the need for requirements elicitation and analysis. Explain the different process activities involved. (10 Marks)
- b. Why risk management is important in project management? Explain different stages in risk management. (10 Marks)
- 4 a. What is data flow model? With an example, show the notations used in data flow model. (10 Marks)
- b. Explain the terms :
 - i) Domain requirements (03 Marks)
 - ii) User requirements (03 Marks)
 - iii) System requirements. (04 Marks)

PART – B

- 5 a. Explain why it is necessary to design the system architecture. What are the system factors affected by system architecture? Explain. (10 Marks)
- b. Distinguish between an object and an object class. Give example. (06 Marks)
- c. What are concurrent objects? Explain different kinds of concurrent object implementations. (04 Marks)
- 6 a. What is rapid delivery and deployment of new systems? Explain its importance. (10 Marks)
- b. What are the different types of software maintenance? What are the key factors that distinguish development and maintenance? (10 Marks)
- 7 a. Distinguish between software inspection and testing. What are the advantages of inspection over testing? (08 Marks)
- b. Explain with illustrations :
 - i) Integration testing (06 Marks)
 - ii) Release testing (06 Marks)
- 8 a. Explain Maslow's human-needs hierarchy of motivating people. (10 Marks)
- b. What are the factors affecting software pricing? What are the two types of metrics used? Explain. (10 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.

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Fifth Semester B.E. Degree Examination, Dec.09/Jan.10
System Software

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, choosing at least two from each part.

PART-A

- 1** a. What is system software? Differentiate it from application software. (06 Marks)
 b. Explain the instruction formats and addressing modes of SIC/XE machine architecture. (10 Marks)
 c. Explain with an example, a simple input and output on SIC/XE machine architecture. (04 Marks)
- 2** a. What are the fundamental functions of any assembler? With an example, explain any six assembler directives. (10 Marks)
 b. Explain the data structures used in assembler algorithms. (06 Marks)
 c. What is program relocation? Explain the problems associated with it and their solutions. (04 Marks)
- 3** a. What are literals? Differentiate literals from immediate operands. (04 Marks)
 b. Explain the structure of load-and-go assembler. (06 Marks)
 c. Explain how multipass assembler handles the following forward reference.
- | | | | |
|---|--------|------|---------------|
| 1 | HALFSZ | EQU | MAXLEN/2 |
| 2 | MAXLEN | EQU | BUFEND-BUFFER |
| 3 | PREVBT | EQU | BUFFER - 1 |
| 4 | BUFFER | RESB | 4096 |
| 5 | BUFEND | EQU | * |
- Assume that, when assembler goes to line 4, location counter contains 1.34(hex). (10 Marks)
- 4** a. Briefly explain the boot strap loader, with the algorithm. (10 Marks)
 b. With a diagram, explain how object program can be processed using linkage editor. (10 Marks)

PART-B

- 5** a. What is an interactive editor? Explain the typical editor structure. (10 Marks)
 b. Explain the different debugging functions and capabilities. (10 Marks)
- 6** a. Explain the data structures involved in macroprocessor algorithms. (06 Marks)
 b. Explain the advantages and disadvantages of general purpose macroprocessors. (08 Marks)
 c. Explain the features of MASM macroprocessor. (06 Marks)
- 7** a. Explain three basic sections of a LEX program. (08 Marks)
 b. What is regular expression? Briefly explain all the characters that form regular expression. (12 Marks)
- 8** a. What is shift/reduce parsing? Explain the parsing of the input "fred = 12 + 13" and represent it using parse tree. (10 Marks)
 b. Explain the ambiguity while passing $2 + 3 \times 4$. Explain the solution for it. (10 Marks)

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Fifth Semester B.E. Degree Examination, Dec.09/Jan.10
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. Define an operating system. Discuss its role with user and system viewpoints. (06 Marks)
 - b. Give the features of symmetric and asymmetric multiprocessing systems. (04 Marks)
 - c. Briefly explain the common classes of services provided by the various operating systems for helping the user and for ensuring the efficient operation of the system. (10 Marks)
2.
 - a. With a diagram, explain the different states of a process. (06 Marks)
 - b. Differentiate between long-term and short-term schedulers. (04 Marks)
 - c. Suppose the following jobs arrive for processing at the times indicated. Each job will run the listed amount of time.

Job	1	2	3
Arrival time	0.0	0.4	1.0
Burst time	8	4	1

- i) Give a Gantt chart illustrating the execution of these jobs, using the non pre-emptive FCFS and SJF scheduling algorithms.
 - ii) What is turn around time and waiting time of each job for the above algorithms?
 - iii) Compute average turn around time if CPU is left idle for the first 1 unit and then SJF is used. (Job1 and Job2 will wait during this time) (10 Marks)
3.
 - a. Discuss various multithreading models, with a diagram. (06 Marks)
 - b. Explain the three requirements that a solution to the critical-section problem, must satisfy. (04 Marks)
 - c. State the dining philosophers problem and give a solution for the same, using semaphores. Write the structure of philosopher i. (10 Marks)
 4.
 - a. Define the hardware instructions test and set() and swap(). And also give the algorithms for implementing mutual exclusion with these instructions. (06 Marks)
 - b. Describe the necessary conditions for a deadlock situation to arise, in a system. (04 Marks)
 - c. Consider the following snapshot of a system:

	Allocation				Maximum				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P ₀	0	0	1	2	0	0	1	2	1	5	2	0
P ₁	1	0	0	0	1	7	5	0				
P ₂	1	3	5	4	2	3	5	6				
P ₃	0	6	3	2	0	6	5	2				
P ₄	0	0	1	4	0	6	5	6				

Answer the following questions using the Banker's algorithm:

- i) What is the content of the matrix need?
- ii) Is the system in a safe state?
- iii) If a request from process P₁ arrives for (0, 4, 2, 0), can the request be granted immediately? (10 Marks)

PART – B

- 5 a. What is paging and swapping? (04 Marks)
b. With a diagram, discuss the steps involved in handling a page fault. (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 algorithms? Which is the most efficient among them? (10 Marks)
- 6 a. Explain the following :
i) File types (12 Marks)
ii) File operations
iii) File attributes (08 Marks)
b. Explain the methods used for implementing directories.
- 7 a. A disk drive has 200 cylinders numbered from 0 to 199. The disk head is initially at cylinder 53. The queue of pending requests in FIFO order is : 98, 183, 37, 122, 14, 124, 65, 67. Starting from the current head position, what is the total distance traveled (in cylinders) by the disk arm to satisfy the requests using algorithms FCFS, SSTF, SCAN and LOOK. Illustrate with figures in each case. (12 Marks)
b. Describe the access matrix model used for protection purpose. (08 Marks)
- 8 Write short notes on :
a. Components of LINUX system
b. Interprocess communication facility in LINUX
c. SCAN and C-SCAN disk scheduling
d. Tree directory structure. (20 Marks)

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Fifth Semester B.E. Degree Examination, Dec.09/Jan.10

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. Explain the typical components of a DBMS with a neat diagram. (10 Marks)
- b. Define and explain the following terms with an example each :
i) Snapshot ii) Intension iii) Extension iv) Schema construct (05 Marks)
- c. What is meant by “persistent storage for program objects”? Explain. (05 Marks)
- 2 a. Explain how role names are assigned in case of recursive relationships? Illustrate this concept with a diagram. (06 Marks)
- b. What is meant by partial key? Explain. (04 Marks)
- c. Design an ER diagram for keeping track of information about an AIRLINE database taking into account at least six entities. (10 Marks)
- 3 a. Define referential integrity constraint. Explain the importance of referential integrity constraint. How is this constraint implemented in SQL? (08 Marks)
- b. Consider the following relations and write relational algebra queries:
Employee (Fname, SSN, Salary, Super-SSN, DNo) ; Works ON (ESSN, PNO, hours) ;
Department (Dname, Dnumber, Mgr-SSN) ; Dependent (ESSN, Dependent name)
i) Retrieve the highest salary paid in each department.
ii) Retrieve the name of managers who have more than two dependents.
iii) Retrieve the number of employee's and their average salary working in each department. (12 Marks)
- 4 a. Explain IN and EXISTS operators with suitable examples. (08 Marks)
- b. Consider the same data given in Q3(b), and write the following queries in SQL:
i) Retrieve the name of all employees who do not have supervisor.
ii) Retrieve the name of each employee who has a dependent with the same first name and same sex as the employee.
iii) Retrieve the SSN of all employees who work on project numbers 1, 2, 3. (12 Marks)

PART – B

- 5 a. How is a view created and dropped? What problems are associated with updating of views? (10 Marks)
- b. What is embedded SQL? With an example, illustrate how would you connect to a database, fetch records and display. Also explain the concept of stored procedure in brief. (10 Marks)
- 6 a. Which normal form is based on the concept of transitive functional dependency? Explain with an example the decomposition into 3NF. (10 Marks)
- b. Define multi valued dependency. Explain 4NF with an example. (10 Marks)
- 7 a. Explain the three phases involved in an ARIES algorithm with an appropriate example. (10 Marks)
- b. Given a relation R with four attributes $R = \{A B C D\}$ and the following FD, identify the candidate keys for R and the 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 :
a. Two phase locking protocol b. Transaction support in SQL
c. Write ahead log protocol d. Time stamp ordering algorithm (20 Marks)

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Fifth Semester B.E. Degree Examination, Dec.09/Jan.10
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 four important fundamental characteristics? (06 Marks)
 - b. What is a protocol? What are its key elements? (02 Marks)
 - c. Explain OSI reference model, with a neat figure. (08 Marks)
 - d. Differentiate between:
 - i) ARP and RARP
 - ii) ICMP and IGMP
 - iii) UDP and TCP (04 Marks)

- 2
 - a. Suppose an application layer wants to send L-bytes message to its peer process using the existing TCP connection. The TCP consists of message plus 20 bytes of header. The segment is encapsulated into IP packet that has an additional 20 bytes of header. The IP packet in turn goes inside the ethernet frame that has 18 bytes of header and trailer. What percentage of the transmitted byte in the physical layer correspond to the message information? L = 100 byte. (06 Marks)
 - b. Define bandwidth. A periodic signal has bandwidth of 20 Hz. The highest frequency is 60Hz. What is the lowest frequency? Draw the spectrum, if the signal contains all frequencies of the same amplitude. (04 Marks)
 - c. Explain briefly, with neat figures, the two approaches for digital transmission. (08 Marks)
 - d. A signal travels through an amplifier and the power is increased 10 times. Calculate the power gained. (02 Marks)

- 3
 - a. A voice grade channel of a telephone network has a bandwidth of 3.4kHz.
 - i) Calculate channel capacity for S/N = 30 dB.
 - ii) Calculate S/N required to support information transfer at 4800 bps. (06 Marks)
 - b. What is FDM? Briefly explain its multiplexing and demultiplexing process. (06 Marks)
 - c. Explain briefly the two spread spectrum techniques. (08 Marks)

- 4
 - a. Explain briefly the fiber optic cable, with a neat figure. (08 Marks)
 - b. Find the codeword C(x) for the information $d(x) = x^3 + 1$ with the generator polynomial $t(x) = x^3 + x + 1$. (06 Marks)
 - c. What is internet checksum? With an example list the steps undertaken by the sender and receiver for error detection. (06 Marks)

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PART – B

- 5 a. Explain briefly, with neat figures, stop-and-wait ARQ and Go-Back N ARQ. (12 Marks)
b. Explain the frame format and transitional phases of point-to-point protocol. (08 Marks)
- 6 a. A network transmits 200 bit frame on a shared channel of 200 kbps. For aloha and slotted aloha, what is the
i) requirement to make the frame collision free?
ii) throughput if the system produces 1000 frames/sec? (08 Marks)
b. Define channelization and list its three protocols. (10 Marks)
c. How does p-persistent method improve efficiency? (02 Marks)
- 7 a. Explain with a neat figure, 802.3 MAC frame format. (08 Marks)
b. Explain the hidden and exposed station problems in IEEE 802.11. (12 Marks)
- 8 a. Explain briefly the three categories of satellites. (10 Marks)
b. Explain briefly STS-1 frame format. (10 Marks)

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Fifth Semester B.E. Degree Examination, Dec.09/Jan.10
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 :
 i) Alphabets ii) Strings iii) Power of an alphabet iv) Language. (06 Marks)
 b. Define DFA. Design a DFA to accept the binary numbers which are divisible by 5. (06 Marks)
 c. Convert the following NFA to its equivalent DFA using subset construction :

	0	1
→ p	{p, q}	{p}
q	{r}	{r}
r	{s}	ϕ
* s	{s}	{s}

(08 Marks)

- 2 a. Design an NFA that accepts the language $L(aa^*(a+b))$. (04 Marks)
 b. Consider the following ϵ -NFA :

	ϵ	a	b	c
→ p	ϕ	{p}	{q}	{r}
q	{p}	{q}	{r}	ϕ
* r	{q}	{r}	ϕ	{p}

- i) Compute the ϵ -closure of each state.
 ii) Give all the strings of length 3 or less accepted by the automation
 iii) Convert the automation to a DFA. (10 Marks)
 c. Write the regular expressions for the following languages :
 i) The set of all strings over $\Sigma : \{a, b, c\}$ containing atleast one a and atleast one b.
 ii) $L = \{w : |w| \bmod 3 = 0\}$ Assume $\Sigma : \{a, b\}$
 iii) The set of strings of 0's and 1's whose 10th symbol from the right end is 1. (06 Marks)
- 3 a. Convert the regular expression $(0 + 1)^* 1(0 + 1)$ to an ϵ -NFA. (04 Marks)
 b. State and prove the pumping lemma for regular languages. (06 Marks)
 c. Consider the transition table Q3(c), of DFA given below :

	0	1
→ A	B	A
B	A	C
C	D	B
* D	D	A
E	D	F
F	G	E
G	F	G
H	G	D

- i) Draw the table of distinguishabilities of this automaton
 ii) Construct the minimum-state equivalent DFA using table filling algorithm. (10 Marks)

- 4 a. Define CFG. Write CFG for the language $L = \{0^n 1^n \mid n \geq 1\}$, i.e. the set of all strings of one or more 0's followed by an equal number of 1's. (08 Marks)
- b. Consider the grammar –
 $S \rightarrow aS \mid aSbS \mid \epsilon$
 Is the above grammar ambiguous? Show in particular that the strings aab has two :
 i) Parse trees
 ii) Leftmost derivation
 iii) Rightmost derivations. (12 Marks)

PART – B

- 5 a. Define a PDA. Discuss about the languages accepted by a PDA. Design a nondeterministic PDA for the language $L = \{0^n 1^n \mid n \geq 1\}$. (12 Marks)
- b. Convert the following grammar
 $S \rightarrow 0S1 \mid A$
 $A \rightarrow \mid A0 \mid S \mid \epsilon$
 to a PDA that accepts the same language by empty stack. (08 Marks)
- 6 a. State and prove pumping lemma for context free languages. (08 Marks)
- b. What are CNF and GNF of context free grammar? Give examples. (06 Marks)
- c. Using the CFL pumping lemma, show that the following language is not context free.
 $L = \{a^i b^j c^k \mid i < j < k\}$. (06 Marks)
- 7 a. With a neat diagram, explain the working of a basic turing machine. Design a turing machine to accept $L = \{ww^R \mid w \in (a + b)^*\}$. (12 Marks)
- b. Explain the general structure of multi-tape and non deterministic turing machines and show that these are equivalent to basic turing machine. (08 Marks)
- 8 Write short notes on :
 a. Recursive languages and halting problem
 b. Post's correspondence problem
 c. Chomsky hierarchy
 d. Applications of CFG's (20 Marks)

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