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

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 the key challenges facing software engineering. (05 Marks)
   c. Explain the different phases of the system engineering process with a neat diagram. (10 Marks)

2 a. Explain the four principle dimensions of dependability. (04 Marks)
   b. Illustrate with a figure, the mapping of a software system from input to output. (04 Marks)
   c. Explain with a figure, the following process models:
      i) Water fall model
      ii) Evolutionary development (12 Marks)

3 a. What are the different metrics for specifying the non-functional requirements? Explain any two of them. (06 Marks)
   b. Explain with a figure, the requirement elicitation and analysis process. (08 Marks)
   c. List and explain the different types of checks that should be carried out on requirements in a requirement document. (06 Marks)

4 a. Draw the data flow diagram for order processing and explain the different process activities involved in it. (10 Marks)
   b. List and explain the different activities involved in software project management. (10 Marks)

PART – B

5 a. Explain with a figure, the shared repository model and give its advantages and disadvantages. (10 Marks)
   b. Explain the different stages involved in object oriented design process. (05 Marks)
   c. With a neat figure, explain the different layers in the weather station software. (05 Marks)

6 a. What is a pair programming? List its advantages. (05 Marks)
   b. Explain with a diagram, the process of prototype development. (08 Marks)
   c. Explain the different factors used in application assessment. (07 Marks)

7 a. What are advantages of inspection over testing? (04 Marks)
   b. Explain with a figure, the clean room software development process. (08 Marks)
   c. Explain with example:
      i) Block-Box testing
      ii) Path testing (08 Marks)

8 a. List and explain the factors governing staff selection. (10 Marks)
   b. Explain in detail algorithmic cost models in project planning. (10 Marks)

* * * * *

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
System Software

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a.   Why SIC is called hypothetical computer? Explain SIC machine architecture with respect to registers, instruction format and instruction sets.   **(06 Marks)**

    b.   List and explain instruction formats of SIC/XE machine. Find the target address, addressing mode and value of register 'A' for the following machine code using memory address or content given :

				Address	Content
i)	03C300	(B) = 007000		3030	003600
ii)	010030	(PC) = 005000		3600	103000
iii)	003600	(X) = 000090		7390	00C303
				C303	003030

                                                        (10 Marks)

    c.   Write a SIC/XE program to add corresponding elements of array A and B, and store result in array C, where array size is 200 words each.   **(04 Marks)**

2   a.   What are the steps required to translate source code to object code. Write the format of header, text and end records.   **(06 Marks)**

    b.   What are the data structures used in assembler? Write pass-2 algorithm of assembler.   **(08 Marks)**

    c.   Write an object code for following SIC/XE instructions:
       i)   0017   J   CLOOP   (CLOOP at location 0006)
       ii)   103C +LDT #4096   (Object code of J is 36h and LDT is 74h)
       iii)   0020   LDT #3   **(06 Marks)**

3   a.   Explain symbol defining statements and expressions. Identify the type of following expressions:
           1. ABCDEF – GHIJKL
           2. 100 – ABCDEF
           3. 50 * GHIJKL
           4. XYZABC + ABCXYZ
    where all variables represents address within program.   **(08 Marks)**

    b.   Explain control section in detail with format of define, refer and modification record (revized).   **(08 Marks)**

    c.   What are different assembler design options? Load-and-go assembler is useful in program development and testing, give reasons.   **(04 Marks)**

4 a. What are the relocating loaders? Write an algorithm for SIC/XE relocating loader. **(06 Marks)**
   b. What are the different loader design options? Explain linkage editor in comparison with linking loader. **(08 Marks)**
   c. Explain MS-DOS linker with object module. **(06 Marks)**

PART – B

5 a. Define document. What are the tasks accomplished by document editing process? **(04 Marks)**
   b. With neat diagram explain structure of editor. **(08 Marks)**
   c. What are the debugging functions and capabilities? **(08 Marks)**

6 a. What are the data structures used in macroprocessor? Write an algorithm for DEFINE, EXPAND and GETLINE procedures. **(10 Marks)**
   b. Explain any two machine independent macro processor features. **(06 Marks)**
   c. Explain ANSC C macro processor. **(04 Marks)**

7 a. What are the meta symbols? Write any five meta symbols and its use. **(04 Marks)**
   b. Write and explain specification of lex program. **(05 Marks)**
   c. Write a lex program to count number of keywords, relational operations, logical operator and special operators. **(06 Marks)**
   d. Write LEX program to remove single in line comments in C program using command line arguments. **(05 Marks)**

8 a. What is passer? What is the output expected from parser? Write following CFG in YACC equivalent form
   $$A \rightarrow BC + \mid CD - \mid EF * \mid \in$$ **(04 Marks)**
   b. Write a YACC program to evaluate given expression using un-ambiguous grammar. **(08 Marks)**
   c. What is the need of priority and associativity? Show with program how they are implemented in YACC program. **(08 Marks)**

* * * * *

Fifth Semester B.E. Degree Examination, Dec.2018/Jan. 2019
Operating System

Time: 3 hrs.
Max. Marks:100

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

PART – A

1 a. Define operating system. Explain different views of operating system. **(08 Marks)**
   b. What are virtual machines? Explain VM-WARE architectures with neat diagram. **(08 Marks)**
   c. Explain process management activities. **(04 Marks)**

2 a. With neat diagram explain different states of a process. **(05 Marks)**
   b. Discuss scheduling criteria used in operating system. **(05 Marks)**
   c. For the following example calculate average waiting time and average turnaround time using FCFS, pre-emptive SJF, and RR[1 time unit] CPU scheduling algorithms.

Jobs	Arrival–Time	Burst–time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

   (10 Marks)

3 a. What is critical section problem? Explain semaphore solution to critical section problem. **(07 Marks)**
   b. Describe the monitor solution to the classical dining philosopher problem. **(08 Marks)**
   c. Define race condition. Explain readers writer problem with semaphore in detail. **(05 Marks)**

4 a. What is deadlock? What are necessary conditions on operating system must satisfy for a deadlock to occur? **(06 Marks)**
   b. For the following snapshot find the safe sequence using Banker's algorithm.

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	0	2	0	0	4	1	0	2
P1	1	0	0	2	0	1			
P2	1	3	5	1	3	7			
P3	6	3	2	8	4	2			
P4	1	4	3	1	5	7			

   i) Is the system in safe state?
   ii) If a request from process P2 arrives for (0, 0, 2) can the request be granted? **(09 Marks)**
   c. How is system recovered from deadlock? **(05 Marks)**

PART – B

5 a. What are translation look aside buffer (TLB)? Explain in detail with a simple paging system with a neat diagram. **(08 Marks)**

   b. Given the memory partitions of 100k, 500k, 200k, 300k and 600k. Apply first fit and best fit algorithm to place 212k, 417k, 112k, 426k processes respectively. **(04 Marks)**

   c. Consider the following page replacement string 10710212303240362107 for a memory with 3 frames. How many page faults occur for LRU and FIFO page replacement algorithms? Which is the efficient among both? **(08 Marks)**

6 a. Explain how free space is managed. **(04 Marks)**

   b. Explain the different file access methods. **(06 Marks)**

   c. What is a file? Explain different allocation methods. **(10 Marks)**

7 a. Describe the access matrix model used for protection purpose. **(08 Marks)**

   b. Suppose the position of cylinder is at 53. The disk drive has cylinders numbered from 0 to 199. The queue of parading request in FIFO order is : 98, 183, 37, 122, 14 124, 65, 67. Starting from the current head position what is the total distance travelled (in cylinders) by the disk arm to satisfy the requests using algorithm : i) FCFS ii) SSTF iii) SCDN and iv) Look. Illustrate with figures in lack case. **(12 Marks)**

8 a. Explain the different system components of Linux OS. **(10 Marks)**

   b. Discuss the interprocess communication facility in UNIX operating system. **(10 Marks)**

* * * * *

USN ☐☐☐☐☐☐☐☐☐☐ 10CS54

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Define Database Management System. Write a note on Actors on the Scene and workers behind the scene. **(10 Marks)**
   b. Define Data Model. Write a neat diagram of Three – Schema Architecture. **(06 Marks)**
   c. Define Logical and Physical data Independence. **(04 Marks)**

2 a. Discuss the role of a high – level conceptual data model in the database design process. **(10 Marks)**
   b. Design an E – R diagram for University database. Consider minimum five entities and indicate Cardinality ratio. **(10 Marks)**

3 a. List important characteristic of Relations. **(04 Marks)**
   b. Which constraint is violating for the below operations :
   i) Insert < 'Arun' , 'K' , 'Sharma' , NULL, '10-8-1990', '# 123, 3rd main', 'm' , 20000 , NULL , 4> into EMPLOPYEE.
   ii) Delete the EMPLOYEE tuple with SSN = '123'.
   iii) Update the DNO of the EMPLOYEE tuple with SSN = 123 to 1. **(06 Marks)**
   c. Consider the schema given below and answer the Queries using Relational algebra operators.
   EMPLOYEE (FN, MI, LN, SSN, Address, B_date, Sex, Salary, SuperSSN, DNO)
   DEPARTMENT (Dname, Dnumber, MgrSSn, Mgr_Start_date)
   DEPT_LOCATION (Dnumb, Dlocation)
   PROJECT (Pname, Pnumber, Plocation, Dnum)
   WORKS_ON (WSSN, PNO, HOURS)
   DEPENDENT (DSSN, Dependent_name, D_sex, Dep_B_date, Relationship)
   i) Retrieve the name, address, salary of employees who work for 'Research department'.
   ii) Find the names of employees who work on all projects controlled by Department Number 4.
   iii) Retrieve the SSN of all employees who either work in department No : 4 or directly supervise an employee who work in dept number 4.
   iv) Retrieve the names of employees who have no dependents.
   v) Retrieve each department number, the number of employees in the department and their average salary. **(10 Marks)**

4 a. Write the syntax of the following :
   i) CREATE
   ii) ALTER
   iii) DROP
   iv) SELECT
   v) INSERT **(10 Marks)**

b. Consider the schema in 3(c) and answer the Queries using SQL commands.
   i) Retrieve sum of salary of all employees.
   ii) Find all employees who were born during 1990s.
   iii) Retrieve the names of all employees who do not have supervisors.
   iv) Retrieve the name of each employee who has a dependent with same name and sex of the employee.
   v) Find the maximum and minimum salary of the employees working in 'Admin department'. **(10 Marks)**

PART – B

5 a. Write short notes on :
      i) Constraints as Assertion and Trigger   ii) Virtual tables. **(10 Marks)**
   b. Explain Embedded SQL and Dynamic SQL. **(10 Marks)**

6 a. List and explain the four Informal design guidelines for Relation schemas. **(10 Marks)**
   b. Define Functional Dependency. Explain 1 NF , 2 NF with an example. **(10 Marks)**

7 a. Define Boyce – Codd Normal Form. Explain 4 NF and 5 NF. **(10 Marks)**
   b. Write a note on :
      i) Discretionary Access Control   ii) Mandatory Access Control. **(10 Marks)**

8 a. Explain four important properties of Transaction. **(10 Marks)**
   b. Write a note on :
      i) 2 PL   ii) ARIES. **(10 Marks)**

*****

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Computer Networks – I

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a neat diagram, explain the functionalities of each layers of OSI – reference model. (10 Marks)
   b. Define networks what are the three criteria necessary for an effective and efficient network. (04 Marks)
   c. Differentiate between :
   i) TCP and UDP.
   ii) Half duplex and full duplex
   iii) ICMP and IGMP. (06 Marks)

2 a. Discuss the three causes of transmission impairments. (06 Marks)
   b. Define line coding. Explain the characteristics of line coding. (10 Marks)
   c. Consider a channel with 1MHz bandwidth, the SNR for this channel is 63. What is appropriate bit rate and signal level? (04 Marks)

3 a. Explain how statistical TDM overcomes the disadvantages of synchronous TDM. (04 Marks)
   b. Discuss the three phases in virtual circuit network with suitable illustration. (10 Marks)
   c. Four sources create 250 characters per sec. The frame contains one-character from each source and one extra bit for synchronization find :
   i) Data rate of each sources
   ii) Duration of each character in each source
   iii) The frame rate
   iv) Duration of output frame
   v) Frame size in bits
   vi) Data rate of link. (06 Marks)

4 a. What are the different types of errors? Explain in brief. (04 Marks)
   b. What is block coding? Explain error detection, and error correction. (09 Marks)
   c. Find the codeword c(x) for the transformation $d(x) = x^3 + 1$, with the generator polynomial $t(x) = x^3 + x + 1$. (07 Marks)

PART – B

5 a. Compare and contrast byte-oriented and bit-oriented protocols. (06 Marks)
   b. Explain briefly with a neat figures :
   i) Stop and wait protocol
   ii) Stop and wait ARQ protocol. (08 Marks)
   c. Describe the different transition phases in Point-to-Point Protocol(PPP). (06 Marks)

6   a.   Write a note on :
           i)   Slotted ALOHA
           ii) 802.3 MAC frame format.   (10 Marks)
     b.   What is channelization? Explain FDMA and TDMA protocols used for channelization.
                                                                                            (07 Marks)
     c.   A pure ALOHA network transmits 200 bits frames on a shared channel of 200 kbps. What is
           the requirements to make this frame collision free.   (03 Marks)

7   a.   Explain the hidden and exposed station problem in IEEE 802.11 MAC layer.   (10 Marks)
     b.   Explain two different types of networks used in Bluetooth.   (06 Marks)
     c.   Calculate the maximum number of simultaneous calls in each cell in IS-136(D-AMPS)
           system. Assume there are no analog control channels.   (04 Marks)

8   a.   Find the class of each address :
           i)   00000001   00001011   00001011   11101111
           ii) 11000001   10000011   00011011   11111111
           iii) 14.23.120.8
           iv) 252.5.15.111.   (04 Marks)
     b.   Discuss the IPV$_4$ header format, with a neat diagram.   (10 Marks)
     c.   What are the advantages of IPV$_6$ over IPV$_4$?   (06 Marks)

* * * * *

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 an example :
   (i) Alphabet   (ii) Strings   (iii) Languages   (iv) Power of an alphabet   **(06 Marks)**
   b. Define DFA. Construct the DFA for the following languages:
   (i) String of a's and b's ending with abb.
   (ii) L = { w / |w| mod S = 0 } on Σ = { a }.   **(06 Marks)**
   c. Convert the following NFA into equivalent DFA [Refer Fig.Q1(c)].   **(08 Marks)**

Fig.Q1(c)

2 a. Write the Regular expressions for following languages:
   (i) L(R) = { w | w $\in$ {0, 1}* with atleast 3 consecutive zeros }
   (ii) L = {$a^n b^m$ | m + n is even}   **(06 Marks)**
   b. Prove that every language defined by regular expression is also defined by finite automata.   **(08 Marks)**
   c. Convert the following regular expressions to NFA with $\in$-Transitions:
   (i) $ab(a + b)^*$ (ii) $aa(b + a)^*$ **(06 Marks)**

3 a. State and prove pumping lemma for regular languages.   **(08 Marks)**
   b. Prove that the following languages are not regular :
   (i) {$a^i b^j$ | i > j }
   (ii) L = { w | $n_a(w) = n_b(w)$ }   **(08 Marks)**
   c. Show that if L_1 and L_2 are regular, so is $L_1 \cap L_2$.   **(04 Marks)**

4 a. Define context free grammar. Obtain the CFG for following languages:
   (i) L = { $a^n b^m c^k$ | n + 2m = k for n ≥ 0, m ≥ 0}
   (ii) L = { ww^R / w $\in$ {a, b}* }   **(08 Marks)**
   b. Construct the left most derivation, right most derivation and parse trees for the grammar.
   $E \rightarrow E + E | E - E | E * E | id$ for input string "id + id * id".   **(06 Marks)**
   c. Is the following grammar ambiguous?
   $S \rightarrow aS | X$
   $X \rightarrow aX | a$ **(06 Marks)**

PART – B

5 a. Define PDA. What are languages of PDA? Construct the PDA to accept language L.
   L = { w $\subset$ w^R / w $\in$ (a+b)* } where w^R is reverse of w. Show the moves made by PDA
   for string "aabcbaa".   **(10 Marks**

b. Define DPDA. Construct DPDA for language
$L = \{a^n b^n \mid n \geq 1\}$ **(05 Marks)**

c. Obtain the PDA for the grammar
$S \rightarrow aABC$
$A \rightarrow aB|a$
$B \rightarrow bA|b$
$C \rightarrow a$ **(05 Marks)**

6 a. Define useless symbols, $\in$-production and unit productions. Simplify the following grammar:
$S \rightarrow aA \mid a \mid Bb \mid cC$
$A \rightarrow aB$
$B \rightarrow a \mid Aa$
$C \rightarrow cCD$
$D \rightarrow ddd$ **(08 Marks)**

b. Define CNF. Convert the following grammar to CNF
$S \rightarrow 0A \mid 1B$
$A \rightarrow 0AA \mid 1S \mid 1$
$B \rightarrow 1BB \mid 0S \mid 0$ **(06 Marks)**

c. Show that language $L = \{ a^n b^n c^n \mid n \geq 0 \}$ is not context free. **(06 Marks)**

7 a. Define Turing machine. Instantaneous description of Turing machine. Obtain a TM for language
$L = \{ 0^n 1^n 2^n \mid n \geq 1 \}$ **(10 Marks)**

b. Explain the following :
(i) Multi-tape turing machines
(ii) Non-deterministic Turing machines
(iii) Simulating a Turing machine by computer. **(10 Marks)**

8 Write short notes on :
a. Halting problem
b. Post's correspondence problem
c. Un-decidable problem
d. Decidability **(20 Marks)**

* * * * *

2 of 2