Total No. of Pages: 03

Roll No. .....

B. Tech. [MC]

6th *Semes*

Supplementary End Semester Examination

(August-2018)

MC-302 Database Management System

***Time 3h* 00 min.**

Max. Marks: 40

NOTE: ***Attempt any FIVE Questions. Assume suitable missing data if any.***

Q1. Differentiate between the following: [3+3+2]

A) Database Instance and Database Schema.

B) Data Definition Language and Data Manipulation Language.

c) Primary key and Candidate Key.

Q2. Consider the relation Instructor (Id, Name, Deptt_name, Salary). Write SQL instructions for the following: [3+3+2]

a) Give a 5% salary raise to instructors whose salary is less than the average of all the instructors.

b) Delete all tuples in the instructor relation pertaining to instructors in the Finance department.

c) Find average salary in each department.

Q3. Consider the following relational schema for a library: [3+3+2]

Member (memb_no, name, dob)

Books (isbn, title, authors, publisher)

Borrowed (memb_no. isbn, date)

Write the following queries in relational algebra

a) Find the name of members who have borrowed any book published by "McGraw-Hill".

PTO

b) Find the name of members who have borrowed all books published by "McGraw-Hill".

c) Find the average number of books borrowed per member.

Q4. A) What is mapping cardinality? Give all its types with examples. [6]

B) Explain the differences among an entity, an entity type and an entity set. [2]

Q5. A) Construct an E-R diagram for a car insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents. [4]

B) List and explain all functional dependencies satisfied by the following relation. [4]

A	B	C
a1	b1	c1
a1	b1	c2
a2	b1	c1
a2	b1	c3

351

Q6. A) Normalize the following schema, with given constraints, to 4NF. [3]

Books (accession_no, isbn, title, author, publisher)
Users (userid, name, deptid, deptname)
Accession_no → isbn
Isbn → title
Isbn → publisher
Isbn →→ author
Userid → name
Userid → deptid
Deptid → deptname

B) Consider the following set F of functional dependencies on the relation schema r(A,B,C,D,E): [1+2+2]
A→BCD, BC→ DE, B→D, D→A

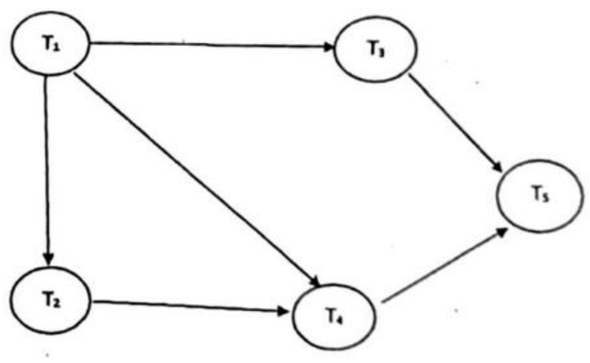
i) Compute B^+.
ii) Compute a canonical cover for the above set of functional dependencies F; give each step of your derivation with an explanation.
iii) Give a 3NF decomposition of r based on the canonical cover.

Q7. A) Construct a B^+ Tree for the following set of key values: [4]
(2, 3, 5, 7, 11, 17, 19, 23, 29, 31)
Assume that the tree is initially empty and the values are added in ascending order. Construct a B^+ tree for the case where number of pointers that will fit in one node is 4.

B) What is the difference between a clustering index and a secondary index. [4]

Q8. A) List the ACID properties. Explain the usefulness of each. [4]

B) Consider the following precedence graph. Is the corresponding schedule conflict serializable? Give reasons also. [4]



Total No. of pages. 03
SIXTH SEMESTER

Roll No.....
B.TECH (MC)

SUPPLEMENTARY EXAMINATION AUGUST 2018

MC-304 THEORY OF COMPUTATION

Time: 3 Hours

Max.Marks: 50

Note: Answer **ALL** by selecting any **TWO** parts from each question.
All questions carry equal marks.

Q1(a) Prove that if L is the set accepted by NDFA, then there exists a DFA which also accepts L.

(b) Construct a DFA equivalent to $M = (\{q_0, q_1\}, \{0,1\}, \delta, q_0, \{q_0\})$, where δ is defined by the state table:

State/Σ	0	1
q_0	q_0	q_1
q_1	q_1	q_0, q_1

(c) Prove by mathematical induction that for any transition function δ and for any two input strings x and y,

$$\delta(q, xy) = \delta(\delta(q, x), y)$$

Q2(a) State and prove Arden's theorem.

(b) State whether the following statements are true or false. Justify your answer with a proof or a counter example.

(i) If G_1 and G_2 are equivalent, then they are of the same type.
(ii) If L is a finite subset of Σ^*, then L is a context free language.
(iii) If L is a finite subset of Σ^*, then L is a regular language.

P.T.O.

(c) Let M = (Q,Σ,δ, q_0,F) be a finite automata. Let R be a relation in Q defined by $q_1 R q_2$ iff $\delta(q_1, a) = \delta(q_2, a)\ \forall\ a \in \Sigma$. Is R an equivalence relation? Justify the answer. Also prove that if $\delta(q, x) = \delta(q, y)$ then $\delta(q, x\,z) = \delta(q, y\,z)\ \forall\ z \in \Sigma$.

Q3(a) State and prove Kleene's theorem. Construct a finite automaton equivalent to the regular expression $a^*(ba^*)^*$.

(b) Construct a reduced grammar equivalent to the grammar

$S \to aAa,\ A \to Sb/bCC/DaA,\ C \to abb/DD,\ E \to aC,\ D \to aDA.$

(c) Define ambiguity in CFG. Prove that a regular grammar cannot be ambiguous.

Q4(a) State and prove Pumping lemma for context free language.

(b) Show that the class $\mathcal{L}_{rl}$ is closed under union where $\mathcal{L}_{rl}$ denotes the family of regular languages.

(c) Reduce the following grammar to GNF:
$S \to AB, A \to BSB, A \to BB, B \to aAb, B \to a, A \to b.$

Q5 (a) Prove that if PDA A= (Q,Σ, Γ,δ, q_0, Z_0,F) accepts L by final state then, we can find a PDA 'B' accepting L by empty store i.e. L=T(A)=N(B).

(b) In how many ways a Turing machine can be described? Explain with suitable examples.

P.T.O.

(c) Consider the Turing machine description given below

Present State	Tape Symbols		
	b	0	1
q_1	$1Lq_2$	$0Rq_1$	-
q_2	bRq_3	$0Lq_2$	$1Lq_2$
q_3	-	bRq_4	bRq_5
q_4	$0Rq_5$	$0Rq_4$	$1Rq_4$
q_5	$0Lq_2$	-	-

Draw the transition diagram of the TM. Draw the computation for the string 00.

END

Total no. of pages :1

6th SEMESTER

SUPP EXAMINATION

Roll No._____

B.Tech (MC- Engg.)

Aug 2018

MC – 306 Financial Engineering

Time : 3 hrs

Max. Marks: 50

Note: *Q.No.1 is compulsory, answer any other three questions.* All questions carry equal mark. Statistical table is allowed. Assume missing data , if any.

1. (a) Let $A(0) = 90, A(1) = 95, S(0) = 25$ dollars and let

$$S(1) = \begin{cases} 32 & \text{with probability } p, \\ 22 & \text{with probability } 1-p, \end{cases}$$

where $0 < p < 1$. For a portfolio with $x = 10$ shares and $y = 15$ bonds calculate $V(0)$, $V(1)$ and K_V

(b) An investor paid \$92 for a bond with face value \$100 maturing in six months. When will the bond value reach \$98 if the interest rate remains constant?

(c) Find the stochastic differential of $\mathrm{Cos}(W(t))$.

(d) The stock price is Rs.200. A 6-month European call option on the stock with strike price Rs.250 is priced using Black-Scholes formula. It is given that the continuously compounding risk free rate is 5%, stock pays no dividend. The volatility of the stock is 20%. Determine the price of call and put options.

2. (a) Let $S(0) = \text{Rs.}80$, $r = 10\%$, $u = 0.2$ and $d = -0.1$. Find the price of a European call and put with strike price $X = \text{Rs.}100$ to be exercised after $N = 2$ time steps using CRR- formula.

(b) Consider the following data

$S(0) = \text{Rs.}50$, $K = \text{Rs.}50$, $\sigma = 30\%$, $r = 8\%$. Assuming the Black Scholes frame work and that the stock pays no dividend, compute 3-months European call price and 3-months European put price using the Black-Scholes formula.

3. (a) Let $\{S_n, n = 0, 1, \dots\}$ be a symmetric random walk and F_n be a filtration. Show that $Y_n = (-1)^n \mathrm{Cos}(\pi S_n)$ is a martingale with respect to F_n.

(b) $\{N(t), t \geq 0\}$ be a Poisson process with parameter λ. Prove that , $\{N(t), t \geq 0\}$ is not a Martingale.

4. (a) If S(0) is the price of asset at t=0, then prove that the forward price will be

$$F(0,T) = \frac{S(0)}{d(0,T)}$$

d(0,T) is the discount factor between t=0 to t=T.

(b) Let A(0) = 100, A(1) = 110, S(0) = Rs.100, strike price Rs.90 and

$$S(1) = \begin{cases} 115 & \text{with probability } 0.7 \\ 85 & \text{with probability } 0.3 \end{cases}$$

find put option price.

5. (a) Prove that portfolio with minimum risk has weights given by

$$w = \frac{C^{-1}e}{e^T C^{-1} e},$$

where C is variance and covariance matrix, and $e^T = (1,1,\dots 1) \in R^n$

(b) Using the following data:

Scenario	Probability	Return K1	Return K2
ω1 (recession)	0.3	−10%	20%
ω2 (stagnation)	0.3	0%	20%
ω3 (boom)	0.4	20%	10%

Find the weights in a portfolio with expected return $\mu V = 40\%$ and compute the risk of this portfolio

Total No. of Pages: 2

Roll No.....

6th Semester

B. Tech.

Supplementary Examination

(August-2018)

MC 310: Software Engineering

Max. Marks: 50

Time: 3 Hours

Note: Attempt any five questions. Each question carries equal marks. Assume missing data suitably (if any).

1. **(a)** Compare iterative enhancement model with evolutionary process model.

   (b) Explain the use case approach of requirements elicitation. What are use case guidelines?

2. **(a)** What is the degree of a relationship? Give an example of each of the relationship degree.

   (b) Explain the concept of function points. Why function points are becoming acceptable in the industry?

3. **(a)** Write short notes on the following:
   (i) Data flow diagrams
   (ii) Data dictionary.

   (b) Discuss various types of COCOMO mode. Explain phase wise distribution of effort.

4. **(a)** Discuss the objectives of modular software design. What are the effects of module coupling and cohesion?

   (b) Write a program for the calculation of roots of a quadratic equation in any programming language and find out all software science metrics for the program.

5. **(a)** Describe McCall software quality model. How many product quality factors are defined and why?

(b) What is the difference between:
(i) Development and regression testing.
(ii) Functional and structural testing.

6. **(a)** What are various kinds of functional testing? Describe any one in detail.

(b) Explain Logarithmic Poisson Execution Time model of software reliability.

Or

Explain basic execution time model of software reliability.

Total No. of pages. 03 Roll No.....

SIXTH SEMESTER B.TECH(MC)

SUPPLEMENTARY EXAMINATION AUGUST 2018

MC- 314 THEORY OF COMPUTATION

Time: 3 Hours Max.Marks: 70

Note: Answer **ALL** by selecting any **TWO** parts from each question.
All questions carry equal marks.

Q1(a) Define Moore machine. Construct a Moore machine equivalent to the Mealy machine defined by the table below:

Present State	Next State			
	a=0		a=1	
	state	output	state	output
$\rightarrow q_1$	q_1	1	q_2	0
q_2	q_4	1	q_4	1
q_3	q_2	1	q_3	1
q_4	q_3	0	q_1	1

(b) Construct a nondeterministic finite automaton accepting the set of all strings over $\{a, b\}$ ending in aba. Use it to construct a DFA accepting the same set of strings.

(c) Define equivalence of two states in a finite automaton. Prove that two states q_1 *and* q_2 are (k+1) - equivalent if they are k-equivalent and $\delta(q_1, a)$ *and* $\delta(q_2, a)$ are also k-equivalent for every $a \in \Sigma$.

Q2(a) Let $G = (\{S, A\}, \{0,1,2\}, P, S)$, where P consists of

$S \rightarrow 0SA2$, $S \rightarrow 012$, $2A \rightarrow A2$, $1A \rightarrow 11$. Show that

P.T.O.

$L(G) = \{0^n 1^n 2^n : n \geq 1\}$.

(b) Let L be the set of all palindromes over {a,b}. Construct a grammar G generating L.

(c) Show that the family of context sensitive languages is closed under concatenation and union.

Q3(a) Write the steps needed for proving that a given set is not regular and hence show that $\{ a^i b^i : i \geq 1 \}$ is not regular.

(b) If L is a regular set over Σ, then show that Σ^*- L and L^T are also regular.

(c) Define ambiguity in CFG. Prove that a regular grammar cannot be ambiguous.

Q4(a) Find a grammar in CNF equivalent to

$S \to aAbB, \quad A \to aA/a, \quad B \to bB/b.$

(b) Construct a grammar in GNF equivalent to the grammar

$S \to AA/a, A \to SS / b.$

(c) State and prove Pumping lemma for context-free languages.

Q5(a)Prove that if L is a context-free language, then we can construct a pda 'A' accepting L by null store.

(b) Construct a pda A accepting $L = \{wcw^T : w \in \{a, b\}^*\}$ by final state.

P.T.O.

(c) Consider the Turing machine description given below

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q_2	bRq_3	$0Lq_2$	$1Lq_2$
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q_4	$0Rq_5$	$0Rq_4$	$1Rq_4$
q_5	$0Lq_2$	-	-

Draw the transition diagram of the TM. Draw the computation for the string 00.

END

Old Scheme

Total No. of pages. 03
SIXTH SEMESTER

Roll No.....
B.TECH(MC)

SUPPLEMENTARY EXAMINATION AUGUST 2018
MC- 314 THEORY OF COMPUTATION

Time: 3 Hours

Max.Marks: 70

Note:Answer **ALL** by selecting any **TWO** parts from each question. All questions carry equal marks.

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q_2	q_4	1	q_4	1
q_3	q_2	1	q_3	1
q_4	q_3	0	q_1	1

(b) Construct a nondeterministic finite automaton accepting the set of all strings over $\{a, b\}$ ending in aba. Use it to construct a DFA accepting the same set of strings.

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P.T.O.

-148-

$L(G) = \{0^n 1^n 2^n : n \geq 1\}$.

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q_4	$0Rq_5$	$0Rq_4$	$1Rq_4$
q_5	$0Lq_2$	-	-

Draw the transition diagram of the TM. Draw the computation for the string 00.

END