

Total No. of Questions: 4



Enrollment No. EN20CS302025...

Faculty of Engineering

Mid Sem – II Examination April – 2022

CS3CO10 Theory of Computation

Programme: B.Tech.

Duration: 2 Hrs.

Branch/Specialisation: CSE

Maximum Marks: 40

- Q.1 i. Which of the following statement is True? 1
- (a) $\{a^n b^n\} \cup \{a^n b^{2n}\}$ is CFL but not DCFL
 - (b) $\{a^m b^m c^n d^n\}$ is CFL but not DFCL
 - (c) $\{a^m b^n\}$ where $m, n \geq 0$ is DCFL not regular language
 - (d) All of these
- ii. A Given grammar is called ambiguous if 1
- (a) Two or more productions have the same non terminal on the LHS
 - (b) A derivation tree has more than one associated sentence
 - (c) Construct two or more parse trees for a single string.
 - (d) All of these
- iii. Which generate language is termed as: 1
- (a) Tokens
 - (b) Tokens
 - (c) Data
 - (d) None of these
- iv. Production Rule: $aAb \rightarrow agb$ belongs to which of the following category? 1
- (a) Type-0
 - (b) Type-1
 - (c) Type-2
 - (d) Type-3
- v. Context free grammar is not closed under 1
- (a) Union
 - (b) Product
 - (c) Complement
 - (d) Kleen star
- vi. Choose the incorrect statement from the following 1
- (a) DPDA is more efficient than NPDA
 - (b) NPDA is more powerful than DPDA
 - (c) Capabilities of DPDA & NPDA are same
 - (d) None of these
- vii. Choose the correct statement from the following 1
- (a) DFA is more powerful than DPDA
 - (b) DPDA is more powerful than DFA
 - (c) NFA is more powerful than NPDA
 - (d) None of these
- viii. Which of the following is wrong? 1
- (a) FA+1 stack is more powerful than FA
 - (b) FA+2 stack is more powerful than FA+1
 - (c) FA+3 stack is more powerful than FA+2
 - (d) None of these

- ix. A string is accepted by a PDA when
 (a) Stack is Empty (b) Acceptance state
 (c) Both a & b (d) None of these
- x. A PDA machine configuration (q, a, x) can be correctly represented as
 (a) Unprocessed input, stack content, current state
 (b) Current state, stack content, unprocessed input
 (c) Current state, processed input, stack content
 (d) Current state, unprocessed input, stack content

- Q.2 i. Define inherently ambiguous language. 2
 ii. What is LMD & RMD with an example? 3
 iii. Consider a grammar G whose productions are $\{S \rightarrow A, A \rightarrow BC/\epsilon, B \rightarrow b/CD, C \rightarrow c/\epsilon, D \rightarrow c/d\}$. Construct a grammar G' without null production. 5
- OR iv. Eliminate the unit production from given grammar
 $\{S \rightarrow A/B/C, A \rightarrow aAa/B, B \rightarrow bB/bb, C \rightarrow aCaa/D, D \rightarrow baD/abD/aa\}$ 5

- Q.3 i. Define PDA tuples.
 ii. Construct a CFG for the following PDA 8
 $M = (\{q_0, q_1\}, \{0, 1\}, \{z_0, X\}, \delta, q_0, z_0, \Phi)$ transitions are:-
 $\delta(q_0, 0, z_0) = (q_0, Xz_0), \delta(q_1, \epsilon, X) = (q_1, \epsilon),$
 $\delta(q_0, 1, X) = (q_1, \epsilon), \delta(q_0, 0, X) = (q_0, XX),$
 $\delta(q_1, 1, X) = (q_1, \epsilon), \delta(q_1, \epsilon, z_0) = (q_1, \epsilon)$
- OR iii. Construct the CFG equivalent to the given PDA transitions are:- 8
 $R1: \delta(q_0, a, z_0) = (q_0, az_0),$
 $R2: \delta(q_0, a, a) = (q_0, aa),$
 $R3: \delta(q_0, b, a) = (q_1, a)$
 $R4: \delta(q_1, b, a) = (q_1, a)$
 $R5: \delta(q_1, a, a) = (q_1, a)$
 $R6: \delta(q_1, \epsilon, z_0) = (q_1, \epsilon)$

Attempt Any Two

- Q.4 i. Explain the CYK algorithm with an example. 5
 ii. Construct the PDA for the language $L = \{a^m b^n c^n / m, n \geq 1\}$ 5
 iii. Construct the PDA for the language $L = \{w \# w^R / w \in (a, b)^*\}$ 5

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Enrollment No. EN20CS303035

Faculty of Engineering

Mid Sem – II Examination April – 2022

CS3CO09 Operating System

Programme: B.Tech.

Duration: 2 Hrs.

Branch/Specialisation: All

Maximum Marks: 40

- Q.1
- i. Which of the following requires a device driver?
a. Register b. Cache c. Main Memory d. Disk 1
 - ii. _____ address is computed by memory management unit (MMU).
a. Physical b. Logical c. Virtual d. all of the above 1
 - iii. _____ address is used in a source code.
a. Physical b. Attribute c. Symbolic d. Logical 1
 - iv. Paging increases the _____ time.
a. Waiting b. Execution c. Context Switch d. All of the above 1
 - v. _____ allocates the largest hole (free fragment) available in the memory.
a. First fit b. Best fit c. Worst fit d. Next fit 1
 - vi. Swap space exists in _____.
a. Primary memory b. Secondary memory
c. CPU d. None of these 1
 - vii. Because of virtual memory, the memory can be shared among _____.
a. Process b. Thread c. Instruction d. none of these 1
 - viii. The mechanism that brings a page into memory only when it is needed is called _____.
a. Segmentation b. Demand Paging
c. Fragmentation d. Internal fragmentation 1
 - ix. _____ is a malicious program that uses a trigger to activate the malicious code.
a. Trap door b. Virus
c. Logic bomb d. Trojan horse 1
 - x. _____ is a condition due to which CPU utilization falls drastically.
a. Inverted page table b. Thrashing
c. Demand paging d. Demand segmentation 1

- Q.2 i. Describe Paging combined with Segmentation. 2
 ii. Differentiate between logical address space and physical address space. 3
 iii. Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order), how would the first-fit, best-fit, and worst fit algorithms place processes size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order) in fixed size partitioning? 5
 OR iv. Explain the working of segmentation technique through diagram. What are advantages and disadvantages of segmentation? 5
- Q.3 i. Define swapping by taking an example. Also mention the constraint of swapping. 4
 ii. Explain the cache memory along with its organization. 6
 OR iii. Explain how paging supports virtual memory with neat diagram. Describe how logical address is translated into physical address. 6
- Q.4 i. Explain system protection and password management. 3
 ii. Explain the role of operating system in security and security breaches. 7
 OR iii. Given page reference string: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. Compare the number of page faults for LRU, FIFO and Optimal page replacement algorithm. Use 4 frames. 7

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Enrollment No..EN20C4303035...

Faculty of Engineering

Mid Sem – II Examination April – 2022

CS3CO25 Database Management System

Programme: B.Tech.

Branch/Specialisation: CSE

Duration: 2 Hrs.

Maximum Marks: 40

- Q.1 i Consider the relation Sale (Date, Customer, Product, Vendor, VendorCity, SalesRep) 1
{Date, Customer, Product} is the composite candidate key and the following functional dependencies are also given:
Vendor → VendorCity, Product → Vendor
What is the highest normal form of the sale relation?
a). 0NF b). 1NF c). 2NF d). 3NF
- ii Which functional dependency types is/are not present in following dependencies? 1
StaffNo, BranchNo → StaffName, BranchName, Position, DOB
StaffNo → StaffName, Position, DOB
BranchNo → BranchName
a). Full functional dependency b). Partial functional dependency
c). Transitive functional dependency d). Both B and C
- iii A BCNF is : 1
a). loss less join and dependency preserving
b). loss less join but not dependency preserving
c). not loss less join but dependency preserving
d). None of these
- iv Third normal form is based on the concept of _____ 1
a). Closure Dependency b). Transitive Dependency
c). Normal Dependency d). Functional Dependency
- v Anomalies are avoided by splitting the offending relation into multiple relations, is also known as 1
a). Accupressure b). Decomposition
c). Precomposition d). Both Decomposition and Precomposition
- vi The state in which the transaction stays while it is executing is term as 1
(a) Active (b) Partial committed (c) initial (d) both A & C
- vii Which of the following concurrency control protocols ensure both conflict serializability and freedom from deadlock? I. 2-phase locking II. Time-stamp ordering. 1
(a) I only (b) II Only (c) both I & II (d) Neither I nor II
- viii Which of the following scenarios may lead to an irrecoverable error in a database system? 1
(a) A transaction writes a data item after it is read by an uncommitted transaction
(b) A transaction reads a data item after it is read by an uncommitted transaction

- (c) A transaction reads a data item after it is written by a committed transaction
 (d) A transaction reads a data item after it is written by an uncommitted transaction
- ix. Consider the following transaction involving two bank accounts x and y. 1
 read(x); x := x - 50; write(x); read(y); y := y + 50; write(y)
 The constraint that the sum of the accounts x is that of
 (a) Atomicity (b) Consistency
 (c) Isolation (d) Durability and y should remain constant
- x. What is ACID properties of Transactions? 1
 (A) Atomicity, Consistency, Isolation, Database
 (B) Atomicity, Consistency, Isolation, Durability
 (C) Atomicity, Consistency, Inconsistent, Durability
 (D) Automatically, Concurrency, Isolation, Durability
- Q.2 i. Consider a relation R(A, B, C, D) with the following functional dependencies: 2
 $A \rightarrow (B, C, D)$, $(A, D) \rightarrow (B, C)$ and $(C, D) \rightarrow (A, B)$. What is/are the candidate key(s).
 ii. Explain ACID Properties. 3
 iii. Explain various locking methods with examples. 5
 OR iv. Explain any two with example: - 5
 Conflict Serializability
 Functional Dependency
 Timestamp based protocol
- Q.3 i. What do you understand by dependency preservation? Give suitable example? 2
 ii. Consider a relation R(A,B,C,D,E) with the following functional dependencies 8
 is given: $A \rightarrow B, C \rightarrow B, B \rightarrow E, E \rightarrow D$ and decomposition of R into R1(A,B,C) and R2(B,D,E).
 1) Does this decomposition have the lossless join property? Is it possible to reconstruct R from R1 and R2 using Natural Join? Give reason for you answer?
 2) What is/are the candidate key(s) of R?
- OR iii. Consider the following schedule due to three transaction (indicate in subscript) 8
 using read & write operation on a data items x, y & z, respectively. S: r1(x); r2(y); r3(y); w2(y); w1(x); w3(x); r2(x); w2(x)
 Draw the precedence graph & find the transaction is conflict serializable or not.
 What is the order of serializability?
- Q.4 i. Explain the terms: 3
 a. Shared lock
 b. Exclusive lock
 ii. Describe the two-phase locking protocol in detail. 7
 OR iii. Explain 3NF and BCNF with an example and What is the main difference 7
 between these two ?

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Enrollment No. EN20CS203035.....

Faculty of Engineering

Mid Sem - II Examination April -2022

CS3ET01 Statistics and Probability

Programme: B.Tech.Branch/Specialisation: All

Duration: 2 Hrs.

Maximum Marks: 40

- Q.1 i. A t-test is a significant test that assess-
- a) The mean of two groups
 - b) The mode of two groups
 - c) The median of two groups
 - d) The standard deviation of three independent variable
- ii. What is the degree of freedom for a sample of size $n=8$ when the sample mean should be 45?
- a) 8
 - b) 7
 - c) 45
 - d) None of these
- iii. Select type-I error from the following-
- a) Accepting null hypothesis when it is true
 - b) Accepting null hypothesis when it is false
 - c) Rejecting null hypothesis when it is true
 - d) Rejecting null hypothesis when it is false
- iv. The value of z is given by $z = 2.12$, at 5% level of significance comment about the null hypothesis of the data-
- a) Null hypothesis should be rejected
 - b) Null hypothesis should be accepted
 - c) Rejection and acceptance of null hypothesis does not depends upon value of z .
 - d) Can't say about the Rejection and acceptance of null hypothesis
- v. What is the standard error of mean in test of specified (single) mean for z test-
- a) $\frac{\sigma^2}{\sqrt{n}}$
 - b) $\frac{\mu}{\sqrt{n}}$
 - c) $\frac{\sigma}{\sqrt{n}}$
 - d) $\frac{\sigma}{\sqrt{n-1}}$

- vi. $E(x + y) =$ 1
 a) $E(x)$
 b) $E(y)$
 c) $E(x) + E(y)$
 d) none of these
- vii. If $y = 5 + 2x$ then $E(y) =$ 1
 a) 5
 b) $E(2x)$
 c) $5 + 2E(x)$
 d) None of these
- viii. The variance for the random variable x is the expected value of- 1
 a) $(x - \bar{x})$
 b) x^2
 c) $(x - \bar{x})^2$
 d) none of these
- ix. If a is any constant then $\text{var}(ax) =$ 1
 a) a^2x^2
 b) $\text{var}(ax^2)$
 c) $a \cdot \text{var}(x)$
 d) $a^2 \cdot \text{var}(x)$
- x. If Sum of square between sample (SSB) = 15 with degree of freedom $k-1$ 1
 then what is the value of mean of sum of square (MSB) when $k=4$.
 a) 4 b) 6 c) 5 d) none of these

- Q.2 i. Explain type-I and type-II error with example 3
- ii. Samples of two electric bulbs were tested for length of life and the following data were obtained: 7

	Type-I	Type-II
Number in the sample	9	7
Mean of the sample	1134	1024
Standard deviation of the sample	35	40

Test at 5% level, whether the difference in the sample mean is significant (tabulated value of t for 13 degree of freedom = 2.16 for 14 degree of freedom = 2.15 and for 15 degree of freedom = 2.13 at 5% level for two tailed area.)

- OR iii. A machine produced 20 defective articles in a batch of 400. After overhauling it produced 10 defectives in a batch of 300. Has the machine improved? (Hint: use test for equality of two proportion) 7
- Q.3 i. If x is a random variable and α is a constant, show that 3
 (i) $E(\alpha) = \alpha$ (ii) $E(\alpha x) = \alpha E(x)$ (iii) $E(x - \bar{x}) = 0$
- ii. (a) Define mathematical expectation 7

(b) A number is chosen at random from the set 1,2,3, ...,100 and another number is chosen at random from the set 1,2,3,.....,50. What is the expected value of the product ?

OR iii. Define random variable and explain its type.

A random variable has the following probability distribution

x	4	5	6	8
P(x)	0.1	0.3	0.4	0.2

Find the expectation and variance of the random variable.

Q.4 i. Write the assumptions of ANOVA

ii. The three samples given below have been obtained from the normal population with equal variance. Test the hypothesis that the population means are equal at 5% level of significance

Sample-I	6	8	5	12	9
Sample-II	5	3	8	7	7
Sample-III	10	7	11	10	12

(Value of F at 5% level with 2 and 12 degree of freedom is 3.88)

OR iii. X is a discrete random variable having the following distribution

x	0	1	2	3	4	5	6	7
P(X = x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

(i) Determine the constant k;

(ii) find $P(X < 6)$

(iii) what will be $P(X \geq 3)$

(iv) $P(0 < X < 5)$
