

Department of Computer Science and Engineering
(Continuous Internal Examination AUG 2024)

Int. MSc. CS Sem V (CSC302, THEORY OF COMPUTATION)

TIME : 1 HOUR

MAX MARKS : 20

Note:- Q1 is compulsory. Attempt ANY TWO from Q2 to Q4.

Q1. Consider the following language $L = \{ w \in (0,1)^* \mid w \text{ ends with substring 'abc'} \}$, where 'abc' is obtained as follows:

Take first three letters of your name. Convert each vowel as '1' and each consonant as '0'.

Example - Suppose your name is 'aryn', pick first three letters ('a', 'r', 'y'), convert into string ('100'). So as per this example, your question is "Consider the following language $L = \{ w \in (0,1)^* \mid w \text{ ends with substring } 100 \}$ ".

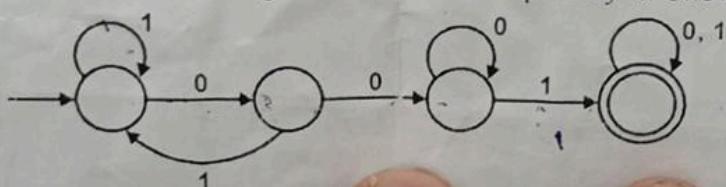
(a) Draw deterministic finite automata (DFA) and hence write regular grammar for this DFA. [5]

(b) Draw DFA and apply Arden's theorem for generating regular expression. [5]

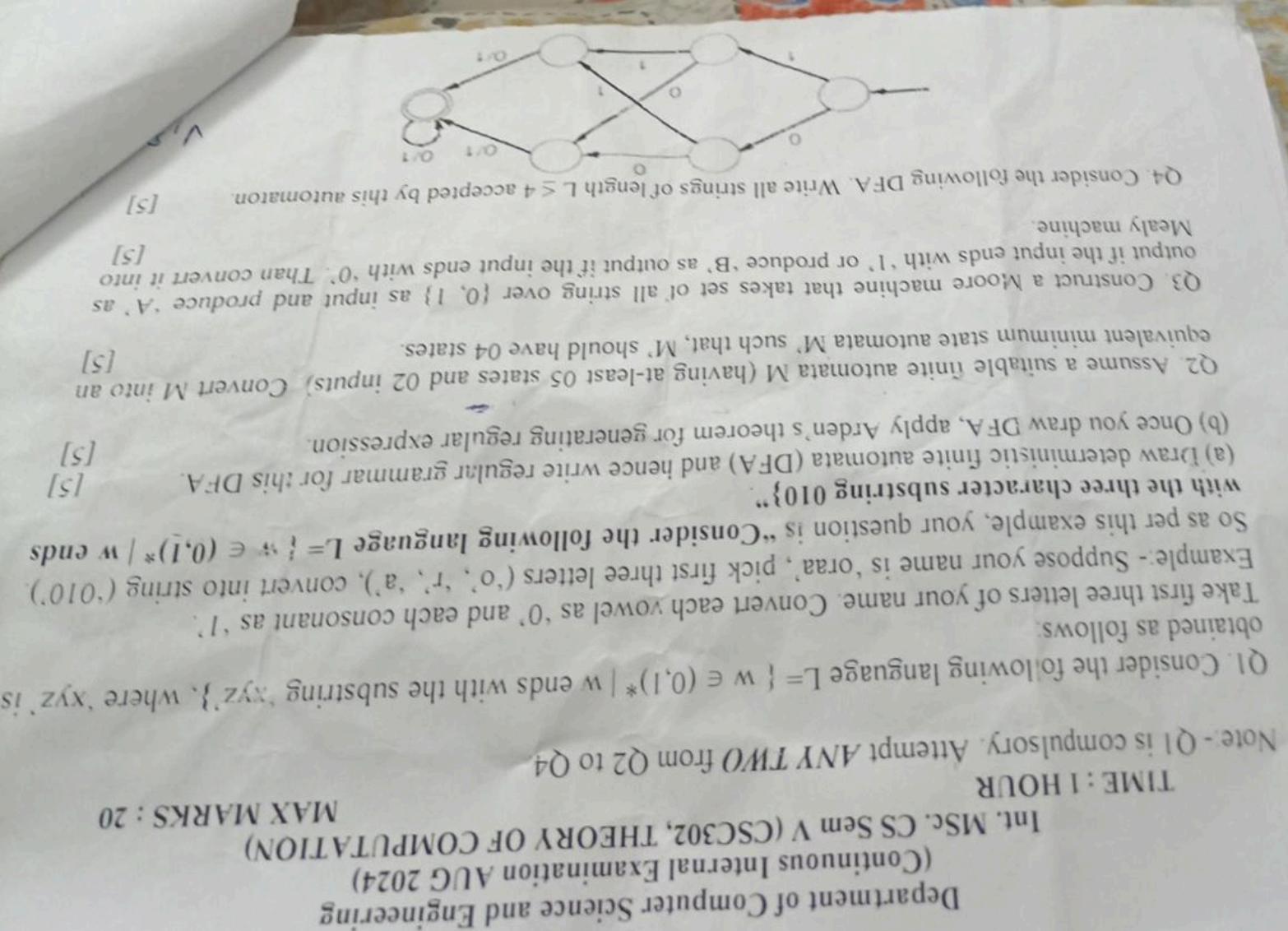
Q2. Assume a suitable finite automata M (having at-least 06 states and 02 inputs). Convert M into an equivalent minimum state automata M' such that, M' should have 04 states. [5]

Q3. Construct a Moore machine that takes set of all string over {0, 1} as input and produce 'P' as output if the input ends with '0' or produce 'Q' as output if the input ends with '1'. Then convert it into Mealy machine. [5]

Q4. Consider the following DFA. Let S denote the set of six bit binary strings in which the first, the fourth, and the last bits are 1. Write all strings in S that are accepted by it. Show your work. [5]



- Note:- Q1 is compulsory. Attempt ANY TWO from Q2 to Q4
- TIME : 1 HOUR**
- MAX MARKS : 20**
- IIT, MSc. CS Sem V (CSC302, THEORY OF COMPUTATION)**
- (Continuous Internal Examination AUG 2024)
- Department of Computer Science and Engineering**
- Q1. Consider the following language $L = \{ w \in \{0,1\}^* \mid w \text{ ends with the substring } xyz \}$, where xyz is obtained as follows:**
- Take first three letters of your name. Convert each vowel as '0' and each consonant as '1'. Example:- Suppose your name is 'orai', pick first three letters ('o', 'r', 'a'), convert into string ("010"). So as per this example, your question is "Consider the following language $L = \{ w \in \{0,1\}^* \mid w \text{ ends with the character substring } 010 \}$ ".
- (a) Draw deterministic finite automata (DFA) and hence write regular grammar for this DFA.
- (b) Once you draw DFA, apply Arden's theorem for generating regular expression.
- Q2. Assume a suitable finite state automata M (having at-least 05 states and 02 inputs). Convert M into an equivalent minimum state automata M' such that, M' should have 04 states.**
- Q3. Construct a Moore machine that takes set of all strings over $\{0, 1\}$ as input and produce $'A'$ as output if the input ends with '1' or produce 'B' as output if the input ends with '0'. Then convert it into Mealy machine.**
- Q4. Consider the following DFA. Write all strings of length $L \leq 4$ accepted by this automation.** [5]
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CENTRAL UNIVERSITY OF RAJASTHAN

(SECOND MID TERM EXAMINATION OCTOBER-2024)

SEMESTER: V

CLASS : Integrated M.Sc.

BRANCH : CS

SUBJECT CODE & NAME: CS-333 & SOFTWARE ENGINEERING

TIME: 1 HOUR

INSTRUCTIONS:

1. The question paper contains four questions.
2. Candidates must attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you got the correct question paper

MAX MARKS: 20

Q1. What does the term "Meta Model" refer to, and why is the Spiral Model referred to as such? [5]
Please illustrate its most appropriate use.

Q2. What are the purposes of Data Flow diagrams & Entity-Relationship diagrams? Draw the complete DFD at least up to 2-levels for a library management system. [2+3=5]

Q3. Who should take part in the evaluation of the requirements? Create a process model that illustrates how the requirements review may possibly be structured. [3+2=5]

Q4. Discuss the COCOMO models (basic, Intermediate, and Detailed) for cost estimation. [5]

What are the three domains of the domain name space? Give examples.

1000 b/s

1×10^{-3}

Section B

Note: This section contains long answer questions (150 words). Attempt any four. Each question carries equal marks. (12*4=48)

Q2.

- a) What is the purpose of cladding in an optical fiber? Discuss. Name the advantages of optical fiber over twisted-pair and coaxial cable.

b) What

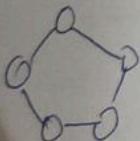
Note: This question paper contains Section A and Section B. Attempt both the sections as per the instructions given therein.

Section A

Note: This section contains short answer questions (about 40 words). Attempt any six. Each question carries equal marks. (2*6=12)

Q1.

- a) Identify the five components of a data communications system.
- b) For n devices in a network, what is the number of cable links required for a mesh, ring, bus, and star topology?
- c) When a person makes a local telephone call to another person, is this a point-to-point or multipoint connection? Justify your answer.
- d) If the data link layer can detect errors between hops, why do you think we need another checking mechanism at the transport layer?
- e) What do you mean by bandwidth-delay product and jitter?
- f) What do you mean by Protocol? Why are protocols needed?
- g) Name the basic network topologies, and mention an advantage of each type. ✓
- h) What are the three domains of the domain name space? Give examples.



1000 b/s
 1×10^{-3} s

Section B

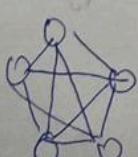
Note: This section contains long answer questions (150 words). Attempt any four. Each question carries equal marks. (12*4=48)

Q2.

- a) What is the purpose of cladding in an optical fiber? Discuss. Name the advantages of optical fiber over twisted-pair and coaxial cable. (3+3)
- b) What are the three measures essential for an effective and efficient computer network? Discuss with suitable examples. (6)

Q3.

- a) Discuss the different ways to measure the performance of the network with suitable examples. (6)



$$\frac{5 \times 4}{2} = 10$$

P.T.O.

$$F = 25 \cdot 34 \cdot 0 \cdot 1 / 16$$

$$L = 25 \cdot 34 \cdot 255 \cdot 254 / 16$$

- b) What do you mean by delay? What are the propagation time and the transmission time for a 5-Mbyte message (an image) if the bandwidth of the network is 1 Mbps? Assume that the distance between the sender and the receiver is 12,000 km and that light travels at 2.4×10^8 mls. (2+4)

Q4.

- a) How does a single-bit error differ from a burst error? Which of the following $g(x)$ values guarantees that a single-bit error is caught? For each case, what is the error that cannot be caught?
- (i) $x + 1$
 - (ii) x^3
 - (iii) $1 \cdot (1.5+4.5=6)$ 10
- b) A sender needs to send the five data items 7, 11, 12, 0, 6. Answer the following:
- (i) Find the checksum at the sender site.
 - (ii) Find the checksum at the receiver site if there is no error.
 - (iii) Find the checksum at the receiver site if the second data item is changed to 10.
 - (iv) Find the checksum at the receiver site if the second data item is changed to 6 and the fifth data item is changed to 11. (1.5*4=6)

$$7+6+12+11$$

36

Q5.

- a) An address space has a total of 1024 addresses. How many bits are needed to represent an address? In a block of addresses, we know the IP address of one host is 25.34.12.56/16. What are the first address and the last address in this block? Also find the size of the address space. (1.5+4.5=6)
- b) What are the differences between classful addressing and classless addressing in IPv4? List the classes in classful addressing and define the application of each class (unicast, multicast, broadcast, or reserve). (2+4)

Q6.

- a) Compare and contrast byte-stuffing and bit-stuffing. Explain the reason for moving from the Stop-and-Wait ARQ Protocol to the Go-Back-N-ARQ Protocol. (2+2)
- b) List the different responsibilities of the transport layer? Discuss the working of SMTP protocol. (2+2)
- c) What are security and protection in computer network? Discuss the different aspects of network security. (2+2)

2	1024
3	512
2	256
1	128
4	64
2	32
2	16
2	8
2	4
2	2
2	1

32
2

35

1010011
21
00111

7+11+12+6
multicast broadcast
36
100100
0110 =

32
16
48
8
6

Maximum marks: 20

Time: 1 Hour

Note: This question paper contains Section A and Section B. Attempt both the sections as per the instructions given therein.

Section A

Note: This section contains short answer questions (about 50 words). Attempt any four.
Each question carries equal marks. (2*4=8)

Q1. For n devices in a network, what is the number of cable links required for a mesh, ring, bus, and star topology?

Q2. Identify the five components of a data communications system.

Q3. Performance is inversely related to delay. When you use the Internet, which of the following applications are more sensitive to delay and why?

- (i) Sending an e-mail
- (ii) Copying a file
- (iii) Surfing the Internet

Q4. Differentiate between a port address, a logical address, and a physical address with suitable examples.

Q5. Find the correct match of the following with one or more layers of the OSI model:

- (i) Format and code conversion services
- (ii) Establishes, manages, and terminates sessions
- (iii) Log-in and log-out procedures
- (iv) Provides independence from differences in data representation

Section B

Note: This section contains long answer questions (150 words). Attempt any two. Each question carries equal marks. (6*2=12)

Q6. a) Differentiate between half-duplex and full-duplex transmission modes with suitable examples. (3)

b) For each of the following four networks with five devices-

- (i) With mesh topology
- (ii) With star topology (not counting the hub)
- (iii) With bus topology
- (iv) With ring topology

Discuss the consequences if a connection fails. (3)

Q7. a) Distinguish between baseband transmission and broadband transmission. (3)

b) What is the propagation time if the distance between the two points is 12,000 km? Assume the propagation speed to be 2.4×10^8 m/s in cable. (3)

Q8. a) What is the purpose of cladding in an optical fiber? Explain. (3)

b) Differentiate between router and hub with suitable examples. (3)

Paper Name: Computer Networks

Time: 1 Hour

Paper Code: CSC-301
Maximum Marks: 20

Note: This question paper contains Section A and Section B. Attempt both the sections as per the instructions given therein.

Section A

Note: This section contains short answer questions (about 40 words). Attempt any four. Each question carries equal marks. ($1.5 \times 4 = 6$)

Q1.

- (i) Can the value of a checksum be all 0s (in binary)? Defend your answer. Can the value be all 1s (in binary)? Defend your answer.
- (ii) Discuss the concept of redundancy in error detection and correction.
- (iii) Define framing and the reason for its need.
- (iv) What are the reasons of transmission impairment?
- (v) List the advantages of optical fiber over twisted-pair and coaxial cable.
- (vi) What are the differences between parallel and serial transmission?

Section B

Note: This section contains long answer questions (150 words). Attempt any two. Each question carries equal marks. ($6 \times 2 = 12$)

Q2. a) Discuss the two major categories of transmission media with suitable examples. What is the significance of the twisting in twisted-pair cable? ($1.5 + 1.5$)

b) In CRC, show the relationship between the following entities (size means the number of bits):

- (i) The size of the dataword and the size of the codeword
- (ii) The size of the divisor and the remainder
- (iii) The degree of the polynomial generator and the size of the divisor
- (iv) The degree of the polynomial generator and the size of the remainder (3)

Q3. a) A block of addresses is granted to a small organization. We know that one of the addresses is 205.16.37.39/26. What are first address, last address and number of addresses? (3)

b) A sender needs to send the four data items 12, 8, 4, 6. Answer the following:

- (i) Find the checksum at the sender site.
- (ii) Find the checksum at the receiver site if there is no error.
- (iii) Find the checksum at the receiver site if the second data item is changed to 10.
- (iv) Find the checksum at the receiver site if the second data item is changed to 6 and the third data item is changed to 10. (3)

X Q4. a) Discuss the working of Stop-and-Wait ARQ protocol with suitable example. (3)

b) Compare and contrast byte-stuffing and bit-stuffing. Which technique is used in byte-oriented protocols? (2+1)

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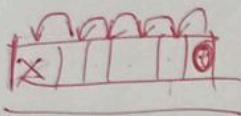
39 -

32-26

6

1276, 10, 6

Intg. M.Sc. Vth Semester, October 2023
Ist Internal Assessment
Computer Networks
Paper Code: CSC-301



Time: 1 Hour

Maximum marks: 20

Note: This question paper contains two sections A and B. Attempt both the sections as per the instructions given therein.

Section A

Note: This section contains short answer questions (about 40 words). Attempt any four. Each question carries equal marks. (2.5*4=10)

Q1. Suppose six devices are required to organize in a network. How many cables are required in case of mesh, ring, bus, and star topology?

Q2. What are the three measures essential for an effective and efficient computer network?

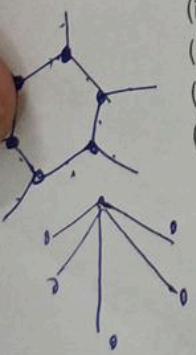
Q3. Performance is inversely related to delay. When you use the Internet, which of the following applications are more sensitive to delay and why?

- (i) Sending an e-mail
- (ii) Copying a file
- (iii) Surfing the Internet
- (iv) Watching movie online

Q4. Differentiate between a port address, a logical address, and a physical address with suitable examples.

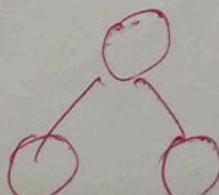
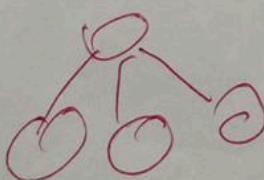
Q5. Find the correct match of the following with one or more layers of the OSI model:

- (i) Format and code conversion services - P
- (ii) Establishes, manages, and terminates sessions - S
- (iii) Log-in and log-out procedures - A
- (iv) Provides independence from differences in data representation - N



30

$$\underline{6 \times 5} = 15$$



Section B

Note: This section contains long answer questions (150 words). Attempt any two. Each question carries equal marks. (10)

Q6. a) Differentiate between half-duplex and full-duplex transmission modes with suitable examples. (5)

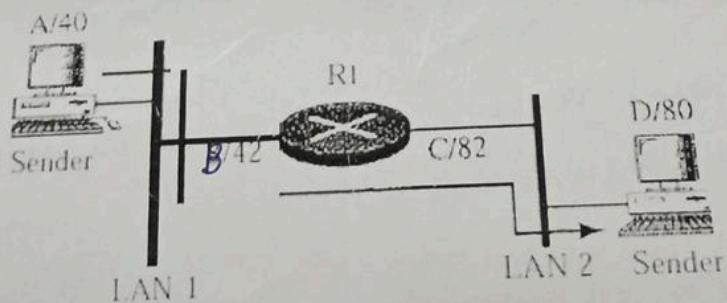
b) For each of the following four networks with five devices-

- (i) With mesh topology
- (ii) With star topology (not counting the hub)
- (iii) With bus topology
- (iv) With ring topology

Discuss the consequences if a connection fails. (5)

Q7. a) What are headers and trailers, and how do they get added and removed? Give suitable examples. (5)

b) In the following figure, consider that the communication is between a process running at computer A with port address x and a process running at computer D with port address y. Show the contents of packets and frames at the network, data link, and transport layer for each hop. (5)



CENTRAL UNIVERSITY OF RAJASTHAN
School of Mathematics, Statistics and Computational Sciences
Department of Computer Science

End Semester Examination, Session 2023-24

Programme : Integrated M.Sc.
Course Code : CSC-303
Course Title : Software Engineering
Course Credit : 4

Semester : V
Maximum Marks : 60
Time Allowed : 3 Hrs
Total Printed Pages : 1

Instructions to Candidates:

1. All Questions are Compulsory. Each Question carries equal marks.

Que 1. Define following terms
(i) Software Measures,
(ii) Software Metrics
(iii) Software Measurement
(iv) Product and Process
(v) Productivity and Effort

OR

Explain the challenges faced in software engineering. How would you delineate the distinctions [10]
between CMMI and Agile methodologies?

Que 2. Illustrate Capability Maturity Model with suitable diagram and explain each step. [10]
OR

Explain the Spiral model used in the Software Development Life Cycle and describe its primary [10]
phases.

Que 3. Develop a comprehensive Data Flow Diagram (DFD) for a Hospital Management System. [10]
OR

Draw a detailed Data Flow Diagram (DFD) for a University ERP System. [10]

Que 4. Define Module Coupling and its all its types with example. How can we achieve good [10]
coupling.

OR

Define Module Cohesion and it's all its types with example. How can we achieve good cohesion. [10]

Funct Logicle
coher. Coherence

Que 5. Explain the concept of Reverse Engineering with scope and tasks. Also explain the levels of [10]
Reverse Engineering.

OR

Explain the Agile Process. How can we use this in software industry. Write the advantage and [10]
disadvantages of Agile Process.

Que 6. What is Testing? Why should We Test? Explain Alpha, Beta and Acceptance Testing [10]
OR

Consider a program for the determination of the nature of roots of a quadratic equation. Its input is a triple of positive integers (say a, b, c) and values may be from interval [0,100]. The program output may have one of the following words.

[Not a quadratic equation; Real roots; Imaginary roots; Equal roots] Design the boundary value test cases.

400 - 10000

3 890

Eni .

2500 -

[10]

Class: Integrated M. Sc.	Semester: VI	Branch: Computer Science	Marks
SUBJECT: Theory of Computation	CODE: CSC-305	Faculty: Mamta Rani	20
Assessment: CIA 2	Date: 24.04.24	Time: 1 hours	
			[Marks 1 x 4 = 4]

Q - 1. Answer all the questions.

[Marks 1 x 4 = 4]

- Q - 1. Answer all the questions.

(i) Consider Following CFGs. Describe the kind of language the CFG generates.

$$S \rightarrow XYX$$

$$X \rightarrow aX \mid bX \mid \Lambda$$

$$Y \rightarrow bbb$$

(ii) Make CFG for the language of all words that have different first and last letters.

(iii) Determine whether word **abaa** is in the CFG

$$S \rightarrow aS \mid aSb \mid X$$

$$X \rightarrow aXa \mid a$$

(iv) Find the left-most derivation for the word **abba** in the CFG.

Q - 2. Do any four.

[Marks 2 x 4 = 8]

- (i) Show that following CFG is ambiguous by finding a word with two distinct trees.

$$S \rightarrow aSb \mid Sb \mid Sa \mid a$$

(ii) Make total tree of the following CFG.

$$S \rightarrow aSb \parallel bX$$

$$X \rightarrow bX \mid b$$

(iii) Kill Λ -production in the following CFG.

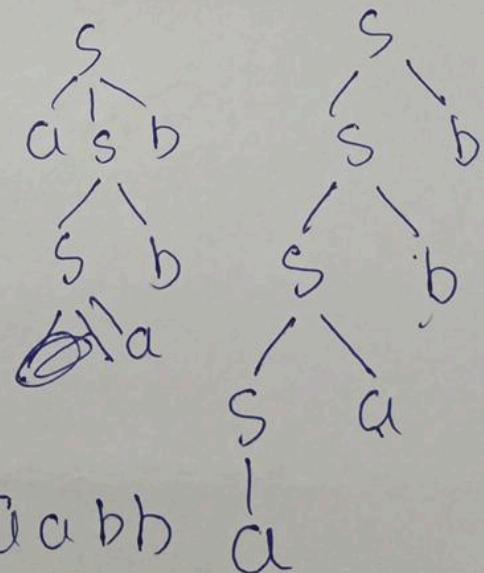
$$S \rightarrow aX \mid bS \mid a \mid b$$

$$X \rightarrow aX \mid a \mid \Lambda$$

(iv) Kill unit-production on the following CFG.

```

graph TD
    S1[S] --> a1[a]
    S1 --> S2[S]
    S1 --> b1[b]
    S2 --> S3[S]
    S2 --> b2[b]
    S3 --> a2[a]
    S3 --> b3[b]
    a1 --- a2
    b1 --- b3
  
```



- (v) Convert following CEG into CNF

S₂ → eVV

VOLUME 2

X - 3

$$Y \rightarrow bY \mid b$$

(v) Convert following CEG into CNF

S₂ → eVV

$$X \rightarrow aS + bS + \dots$$

$$S \rightarrow aAb \mid bAa$$

$$A \rightarrow aA|bA|a|b|^n$$

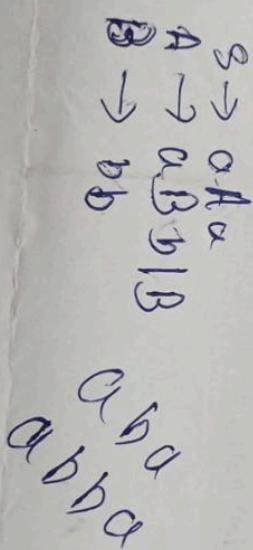
	Class: Integrated M. Sc.	Semester: VI	Branch: Computer Science
SUBJECT: Theory of Computation	CODE: CSC-305	Faculty: Mamta Rani	
Assessment: CIA 2	Date: 24.04.24	Time: 1 hours	20

- (vi) Make CFG1 of PALINDROME and CFG2 of a^* . Find CFG of concatenation of PALINDROME and a^* .

Q-3. Do any TWO.

[Marks ~~4~~ x 2 = 8]

- Build a PDA to accept the language $a^n b^{n+1}$, where $n = 1, 2, 3, \dots$
- Language1 is PALINDROME. Language 2 = $aa^* bb^* aa^*$.
 - Describe the language obtained by intersection of Language1 and Language2.
 - Make CFG of the obtained language
 - Make PDA of the obtained language.



General Instructions: All questions are compulsory.

N*

1. (a) Find min no's of state of DFA for the $L = \{ a^{nk} \mid k > 0, n \text{ is any positive constant} \}$ [4]

(b) Consider the following scenario.

Take your full name (example = spars pottr). Calculate occurrences of each letter of your name (here by using example it would be, s=2, p=2, a=1, r=2, o=1, t=2). Convert your name in form of string by assuming each occurrence as power of that letter (here by using example it would be $L = s^2 p^2 a^1 r^2 o^1 t^2$). Now draw DFA for L. So as per your name and by using mentioned above procedure, draw suitable DFA of your own full name. [6]

OR

(a) How many max. no. of moore machine are possible with 2 states x & y over input alphabet a, b & output 0, 1. [4]

(b) Construct the mealy machine that takes all strings of a's and b's as input and produces 1 as output if the last two symbols in the input are same otherwise, produces 0 as output. [6]

2. Find Regular Expression for. [10]

(a) Language $L = \{ 1, 2, 4, 8, \dots \}$, all these no's are in binary.

(b) Language $L = \{ 1, 2, 4, 8, \dots \}$, all these no's are in unary.

OR

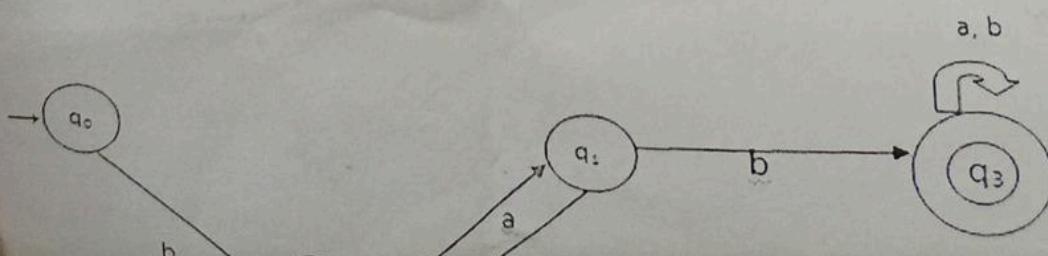
Generate Leftmost derivation and derivation tree for \mathbf{ab}^+* - using following grammar. [10]

$S \rightarrow SS^+ \mid SS^* \mid SS^- \mid a \mid b \mid \Lambda$ (Λ is null symbol)

3. Assume a suitable finite automata M (having at-least 07 states and 02 inputs). Convert M into an equivalent minimum state automata M' such that, M' should have 04 states. [10]

OR

Find the regular expression for the given transition system using Arden's theorem. [10]



CENTRAL UNIVERSITY OF RAJASTHAN

Semester-III/V, End-Semester Examination (ESE), Dec - 2024
 Course Code: CSE203/CSC302
 Time: 3 hours

Title of the Course: Theory of Computation
 Max. Marks: 60

Note

General Instructions: All questions are compulsory.

1. (a) Find min no's of state of DFA for the $L = \{ a^{nk} \mid k > 0, n \text{ is any positive constant} \}$ [4]

(b) Consider the following scenario.

Take your full name (example = spars pottr). Calculate occurrences of each letter of your name (here by using example it would be; s=2, p=2, a=1, r=2, o=1, t=2). Convert your name in form of string by assuming each occurrence as power of that letter (here by using example it would be

$L = s^2 p^2 a^1 r^2 o^1 t^2$). Now draw DFA for L. So as per your name and by using mentioned above procedure, draw suitable DFA of your own full name. [6]

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OR

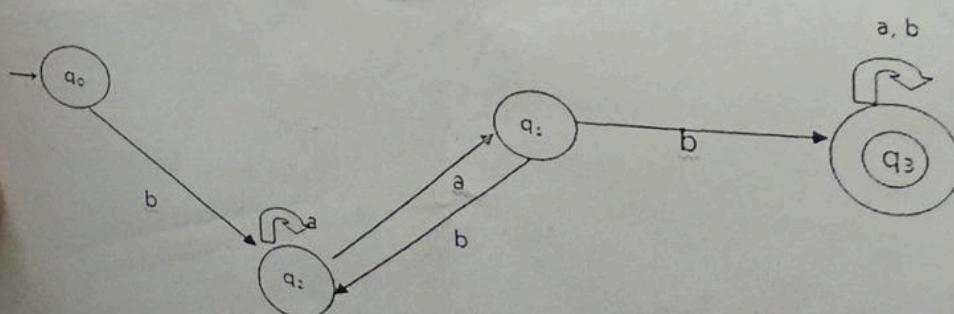
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3. Assume a suitable finite automata M (having at-least 07 states and 02 inputs). Convert M into an equivalent minimum state automata M' such that, M' should have 04 states. [10]

OR

Find the regular expression for the given transition system using Arden's theorem. [10]



2022 JMC 302

4. (a) Find a grammar for set of all odd palindrome strings of English language. [5]
 (b) Generate CNF equivalent to the grammar [5]

$S \rightarrow -S/[S^{\uparrow}S]/a/b$ (S being the only variable)
 OR

Consider the following table. Write Yes or No for the given languages under different operations with valid reason. [10]

S.No	Operation	DCFL	CFL	Recursive Enumerable
1	Concatenation	✓	✓	✓
2	Intersection	✓	✓	✓
3	Compliment	✓	✓	✓
4	Set difference with regular language			

5. Convert the following grammar to the GNF. [10]

$$S \rightarrow a \mid CD \mid CS$$

$$A \rightarrow a \mid b \mid SS$$

$$C \rightarrow a$$

$$D \rightarrow AS$$

OR

Is the language $L = \{ a^n b^n : n \geq 1 \} \cup \{a\}$ deterministic? Design suitable PDA (if exists). [10]

6. (a) Design a TM, which accepts $L = \{w : |w| \text{ is even}\}$ over the language on {a, b}. [6]

- (b) Validate the following [6]

(i) Recursively languages are NOT closed under complementation. [4]

(ii) If L and \bar{L} are both recursively enumerable then L is recursive.

OR

Design a TM, which accepts $L = \{ww^r : w \in \{a,b\}^*\}$, where w^r is the reverse string of w . Example:- if w is abb, then w^r is bba. [10]

WW^r , a
abb bba

[5]

CENTRAL UNIVERSITY OF RAJASTHAN
Semester-V, End-Semester Examination (ESE), December 2024
Course Code: CSC 303 Title of the Course: Software Engineering
Time: 3 hours Max. Marks: 60

General Instructions: All questions are compulsory.

1. (a) What do you mean by the abbreviation SDLC, which stands for "software development life cycle model"? What obstacles may a software development company face if it does not follow any specific SDLC while developing a large-scale software application? [5]

- (b) What is software design? How will you convert the analytical model to the design model? Also, discuss the design concepts briefly. [5]

OR

- (a) What does the term "Meta Model" refer to, and why is the Spiral Model referred to as such? Please illustrate its most appropriate use. [5]

- (b) What are the four Spiral Model waves, and why should they be used? Give at least two examples. [5]

2. (a) Determine the primary rationale and aims for the development of the RAD model. How does the model contribute to the achievement of the defined goals? [6]

- (b) Which software development approach should be used by an organization if it is trying to design a system for an application, the needs of which are neither entirely evident to the business nor understood to the organization? [4]

OR

- (a) Explain how the natural language methodology of requirement elicitation works, including its benefits and drawbacks, and describe the methodologies that are employed in it. [6]

- (b) What goes into a feasibility study, and what does it find? What kind of suggestions are produced because of it, and what kinds of data are utilized to formulate them? [4]

3. (a) What are the most important benefits of developing genuine software by creating a prototype that is already functional? What are some of the drawbacks of adopting this strategy? *Draft some find for* [5]

- (b) What are the purposes of Data Flow diagrams & Entity-Relationship diagrams? Explain with a diagram of each. *creat a find model* [5]

OR

- (a) When comparing functional and non-functional requirements, what are the key distinctions? [5]

- (b) If a customer proposes a modification to an existing requirement, what three steps must be taken before the proposed adjustment may be approved or rejected? [5]

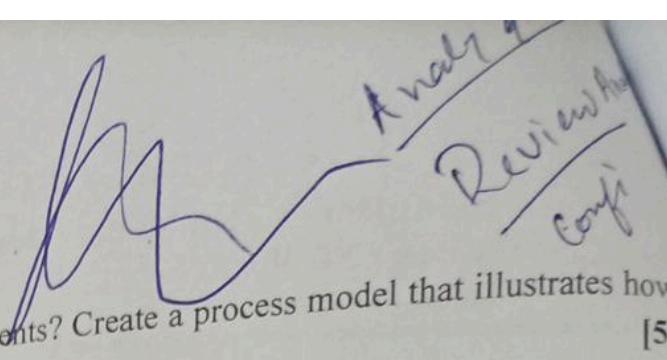
4. (a) To clarify, what do you mean by "risk management"? When there are multiple options for mitigating a given risk, how does one choose the most effective strategy? [6]

- (b) Can you explain the dissimilarities between project planning and software development? What gives? [4]

OR

- (a) Give a brief explanation of the terms used in reliability and the methods used to improve system dependability. [6]

- (b) Discuss the COCOMO models (basic, Intermediate, and Detailed) for cost estimation. [4]



5. Who should take part in the evaluation of the requirements? Create a process model that illustrates how the requirements review may possibly be structured. [5]
- (a) Who should take part in the evaluation of the requirements?
the requirements review may possibly be structured. [5]
- (b) Draw the complete DFD at least up to 2-levels for a library management system. [5]
- OR**
- (a) Define Software architecture. Justify the need to build the system architecture before the requirements, assuming such is the case. Examine the differences between function-oriented and object-oriented layouts. [5]
- (b) State the advantages and disadvantages of LOC-based Cost Estimation. [5]
6. (a) In software engineering, what do you understand by the phrase's cohesion and coupling? To what extent do these ideas help in developing a functional system layout? [6]
- (b) Defend the role of the Use Case diagram as a supplement to the scenario creation template for elucidating requirements. [4]
- OR**
- (a) Write short note on Requirement Specification and Requirement Validation. [6]
- (b) What are the actions performed during software testing? Schematically represent these actions. Which of these activities requires the most effort? [4]

General Instructions: All questions are compulsory.

1. (a) Impact of standardization on EDI in B2B development- Elaborate. [5]
(b) Draw an e-commerce architecture and contrast it with traditional business. [5]
- OR
- (a) What is the function of certifying bodies in the e-commerce environment? How do two parties engage into a legally binding contract in an internet commerce environment? [5]
- (b) For e-commerce, why is network dependability so crucial? What elements lead to issues with network reliability? [5]
2. (a) Which kinds of businesses are more likely to keep up their own private network? What benefits can a private network offer? [6]
- (b) Explain in detail how the Internet and the World Wide Web have contributed to the expansion of e-commerce. [4]
- OR
- (a) Describe the supply chain concept in e-commerce. [6]
- (b) The Client-Server model is the backbone of the E-commerce applications. Are there any security threats to it? If any, discuss. [4]
3. (a) Discuss the challenges that developing nations face with E-Commerce and its influence on customers. Explain the taxation and encryption policies in E-commerce. [5]
- (b) What is an EDI? Describe how a commercial transaction can take place using EDI. What qualities distinguish internet-based EDI? [5]
- OR
- (a) What is cryptography? Explain different type of security measures apply in E-commerce. [5]
- (b) Consider developing a gateway for a retail business. Discuss the many technologies, tools, and components used in its design. [5]
4. (a) Describe the Secure Electronic Transaction (SET) system. Why is SET necessary? What characteristics does SET list? [6]
- (b) What is a payment gateway? Discuss the numerous challenges that arise with the Electronic Payment System. [4]
- OR
- (a) What is the encryption scheme using public keys? How can it be applied to e-commerce to provide authentication? Give appropriate instances to illustrate it. [6]
- (b) Explain various emerging tools that are available in Electronic Commerce for Consumer Data Interface. [4]

5. (a) Discuss briefly the web's security challenges, including the major network security risks and their solutions. Discuss. [5]

(b) Talk about the function, significance, and design considerations of firewalls. [5]

OR

(a) Consider an online banking system and examine the security and privacy concerns associated with electronic cash. [5]

(b) Explain the legal issue and ethical issues related to E-Commerce. [5]

6.

(a). Discuss the objectives and advantages of websites in detail. How can businesses utilize these advantages effectively? [5]

(b). Create a basic HTML code for a web page that includes a header, a paragraph, and a hyperlink to another webpage. Explain the significance of each tag used. [5]

OR

(a). What are the key differences between static and dynamic websites? Explain with examples how dynamic websites enhance user experience. [5]

(b). What are JavaScript functions? Write a function that takes two numbers as input and returns their multiplication. [5]

CENTRAL UNIVERSITY OF RAJASTHAN
School of Mathematics, Statistics & Computational Sciences
Department of Computer Science

$a\ a\ a$
 $a\ a\ b$
 $a\ b\ a$
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End Semester Examination, Session 2023-24

Programme : Integrated MSc
 Course Code : CSC-305
 Course Title : Theory of Computations
 Course Credit : 3

Semester : 6
 Maximum Marks : 60
 Time Allowed : 3 Hrs
 Total Printed Pages : 4

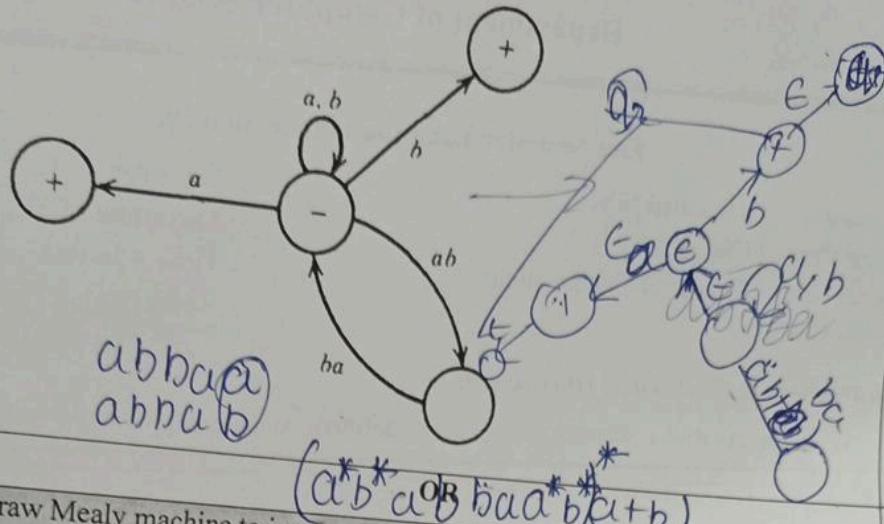
Instructions to Candidates: (If required)

1. In the questions, where alphabet is not defined, consider alphabet $\Sigma = \{a, b\}$.

Q.No.		Marks
1.	(a) Consider the language S^* , where $S = \{a, b\}$. How many words does this language have of length 2? of length 3? of length n?	[5]
	(b) Make regular expression for the language of containing all strings in which total no of a's are divisible by 3.	[2]
	(c) Make finite automata of the language that accepts only those words that have fewer than 4 letters.	[3]
	$\text{A } ab \ ab \ ba \ aa \text{ OR } Bb \ aaaa$ —————	
	(a) Consider the language S^* , where $S = \{ab, ba\}$. Write all the words in S^* that have seven or fewer letters. Can any word in this language contain the substrings aaa or bbb? What is the smallest word that is not in this language	[5]
	(b) Describe in English phrase the language associated with the following regular expression. $(a+b)^*a(\Lambda+bbbb)$	[2]
	(c) Describe the language accepted by the following FA.	[3]
2.	(a) Build a TG that accepts the language L of all words that begin and end with the same double letter.	[2]

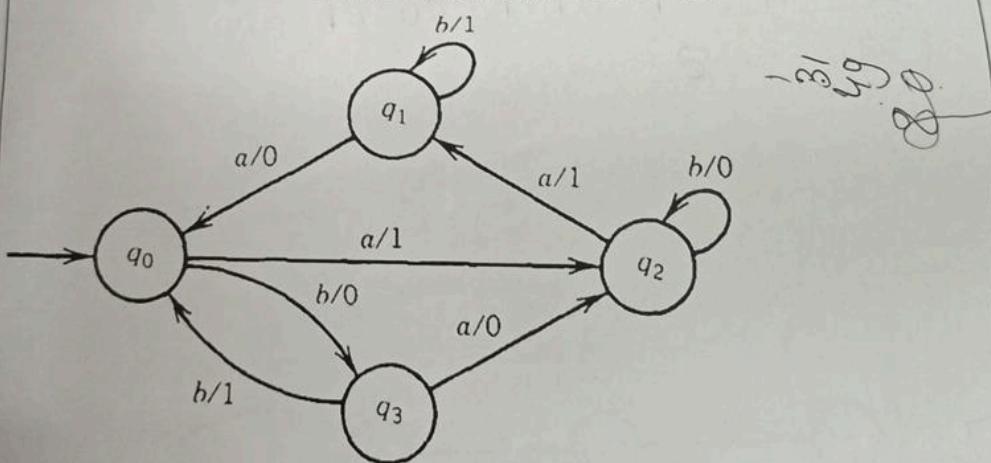
$aa(a+b)^*aa + bb(a+b)^*bb$ $abababab, babbba$
~~abababab, babbba~~ ~~ab, ab, ...~~ ~~aa~~

- (b) Convert the following Transition Graph into an equivalent regular expression.
Show stepwise conversion.

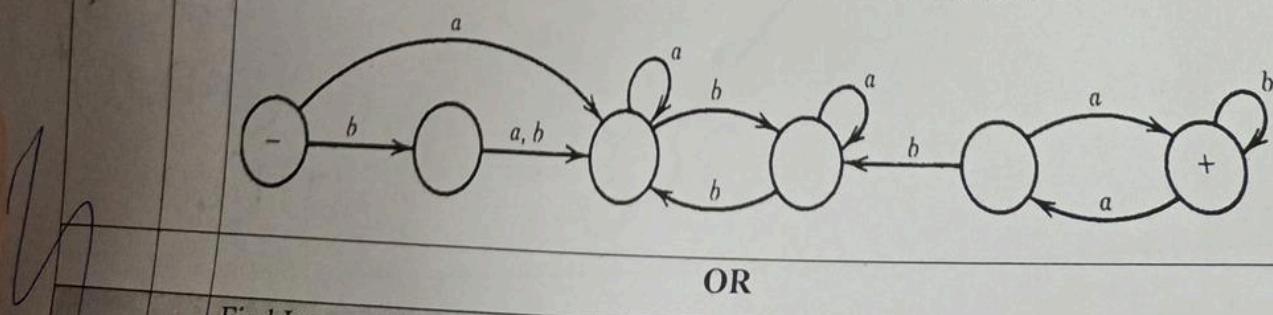


- (a) Draw Mealy machine to increment a binary number by 1. [2]
- (b) Make finite automata FA1 for the language of words of odd length. Make finite automata FA2 for the language of words having aa. Perform FA1.FA2 and draw the resultant finite automata. [8]

3. (a) Convert the following Mealy machine into Moore machine. [6]

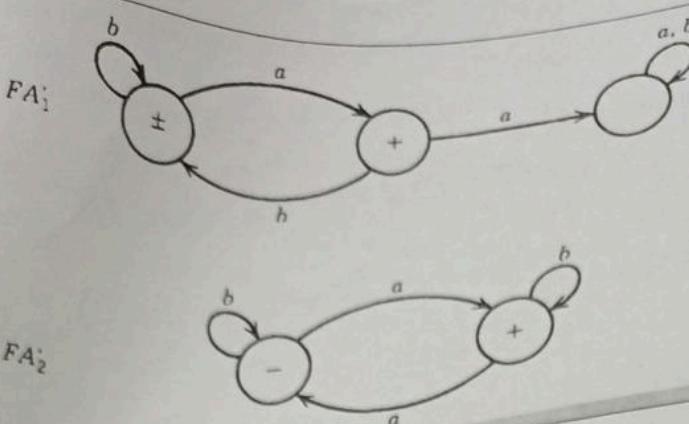


- (b) Check stepwise whether following FA accepts some word or not. [4]



Find Intersection of following two FAs and draw the resulting FA. [10]

regular expression.



4. (a) Describe the kind of language the CFG generates.

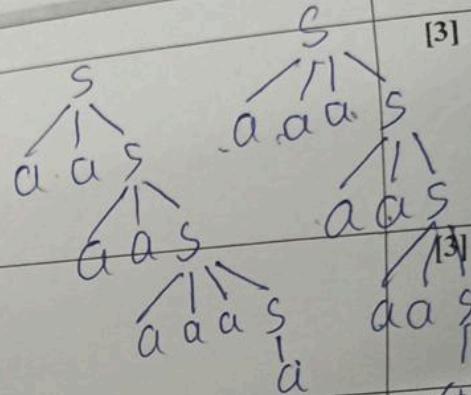
$$\begin{aligned} S &\rightarrow AA \\ A &\rightarrow AAA \\ A &\rightarrow bA \mid Ab \mid a \end{aligned}$$

- (b) Convert following CFG into CNF.

$$\begin{aligned} S &\rightarrow aXX \\ X &\rightarrow aS \mid bS \mid a \end{aligned}$$

- (c) Kill null and unit-productions in the following CFG.

$$\begin{aligned} S &\rightarrow AA \\ A &\rightarrow B \mid BB \\ B &\rightarrow abB \mid Bb \mid \Lambda \end{aligned}$$



$$S \rightarrow aBb$$

$$B \rightarrow$$

$$S \Rightarrow A A$$

$$\Rightarrow aB A$$

$$\Rightarrow abB A$$

$$\Rightarrow abbbA$$

$$\Rightarrow abbaA$$

$$\Rightarrow abbaB$$

$$\Rightarrow abbaA$$

5. (a) Language1 is PALINDROME. Language 2 = $aa^*bb^*aa^*$. $\Rightarrow abba$ [1+1.5+]
(i) Describe the language obtained by intersection of Language1 and Language2. $a^n b^m a^n \quad m, n \geq 1$ $S \rightarrow abba$
(ii) Make CFG of the obtained language \sqcap $B \rightarrow$
(iii) Make PDA of the obtained language.

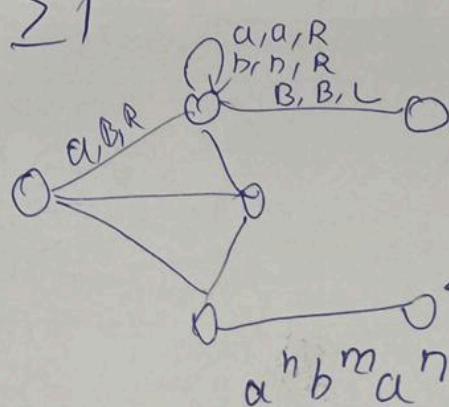
babab
babab

	(b)	Make PDA of the CFG which is union of $(a+b)^*a$ and $a(a+b)^*$. Give CFG of such PDA too.
		OR
	(a)	<p>Consider the following CFG.</p> $S \rightarrow aX \mid b$ $X \rightarrow XXb \mid b$ <p>Find self-embedded symbol (if any) in above CFG. Check whether language is finite using finiteness algorithm.</p>
	(b)	<p>Consider the following CFG.</p> $S \rightarrow XY$ $X \rightarrow XA$ $Y \rightarrow AY$ $A \rightarrow a$ $X \rightarrow a \mid b$ $Y \rightarrow a$ <p>Check whether word babaa is member of the CFG using CYK algorithm.</p>
6.		<p>Build a Turing Machine that accepts the language PALINDROME. Show tracing of the word <u>ababa</u>.</p>

OR

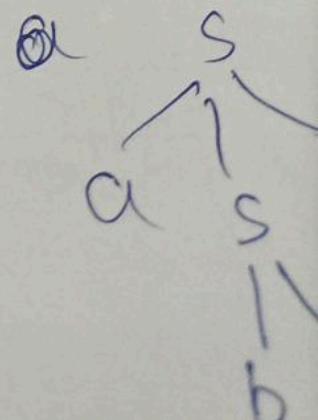
Give definition of POST machine. Make POST machine for the language $a^n b^n$, $n = 0, 1, 2, \dots$

$a^n b^n \quad n \geq 1$



asa | bsa | c | b

$S \rightarrow ASA \mid BSA \mid C \mid B$
 $B \rightarrow bB \mid BlN$



Σ
 Store queue
 Read
 Add
 Start/End

$S \rightarrow aSB \mid ab \rightarrow S \rightarrow aAa$

CENTRAL UNIVERSITY OF RAJASTHAN
School of Mathematics, Statistics & Computational Sciences
Department of Statistics

End Semester Examination, Session 2023-24

Programme : Int. M. Sc.
 Course Code : STA307
 Course Title : Statistical Inference II
 Course Credit : 03

Semester : VI
 Maximum Marks : 60
 Time Allowed : 3 Hrs
 Total Printed Pages : 02

Instructions to Candidates: Attempt all the questions. Write your answer in your own words.

Q.No.		Marks
1.	A Check the complete sufficiency for the Poisson distribution.	[3]
	B Discuss the need and concept of likelihood ratio test.	[1+3=4]
	C Explain "The need and the concept of confidence interval" with a suitable example.	[1+2=3]
OR		
1.	D discuss the concept of mean square error and show that $MSE(T_n) = Var(T_n) + \{bias(T_n)\}^2$, if T_n is an estimator of the parameter θ_n .	[2+2=4]
	E Discuss the need and concept of P -value in testing of hypothesis in detail.	[2+4=6]
2.	A State and prove uniqueness property of UMVUE.	[4]
	B Let $f(x, \theta) = \frac{1}{\mu}; 0 \leq x \leq \mu$. Find UMVUE of μ using Lehmann-Scheffe theorem.	[6]
OR		
3.	C Let x_1, x_2, \dots, x_n be a random sample of the size n from a normal population with the mean θ and the variance σ^2 , where θ and σ^2 are unknown. Perform a test for the hypothesis $H_0: \theta = \theta_0$ (given), $0 < \sigma^2 < \infty$ against the alternative hypothesis $H_A: \theta \neq \theta_0$, $0 < \sigma^2 < \infty$.	[10]
	A Discuss the concept of a complete sufficient statistic. Let X_1, X_2, \dots, X_n be iid uniform $(0, \theta)$ observations, $0 < \theta < \infty$. Check whether the complete sufficiency exists or not.	[10]
OR		
3.	B In the following example, indicate which statements constitute a simple and which a composite hypothesis: (i) X is a random variable whose p.d.f. f is given by $f(x) = 2e^{-2x}; x > 0$. (ii) When tossing a coin, let X be the random variable taking the value 1 if the head appears and 0 if the tail appears. Then, the statement is: The coin is biased. (iii) X is a random variable whose expectation is equal to 5.	[1.5+1.5+1=4]
	C On the basis of a random sample of size 1 from the p.d.f. $f(x; \theta) = f(x, \theta) = \theta e^{-\theta x}; 0 < x < 1 (\theta > 1)$, use the Neyman-Pearson fundamental lemma to derive the MP test for testing the hypothesis $H_0: \theta = 4$ against (!) the alternative	[3+3=6]

		$H_A: \theta = 6$ and (II) $H_A: \theta = 2$ using $\alpha = 0.05$.	
4.	A	Explain the general method of constructing confidence intervals for large samples. Obtain $100(1 - \alpha)\%$ confidence limits for $f(x; \theta) = \frac{1}{\theta} e^{-x/\theta}; x > 0$. Let $\alpha = 0.05$.	[2+8=10]
		OR	
4.	B	What do you mean by a pivotal quantity? Provide an example for it. Explain the construction of a pivotal confidence interval for the variance of a normal distribution if mean is known.	[1+1+8=10]
5.	A	State and prove Lehman-Scheffe theorem.	[10]
		OR	
5.	B	State and prove Rao-Blackwell theorem.	[10]
6.	A	The wall thickness of 25 glass 2-liter bottles was measured by a quality-control engineer. The sample mean was $\bar{x} = 4.05$ millimeters, and the sample standard deviation was $s = 0.08$ millimeter. Find a 95% lower confidence bound for mean wall thickness. Interpret the interval you have obtained.	[8+2=10]
		OR	
6.	B	Let X_1, X_2, \dots, X_n be a random sample from a population with pdf $f(x \theta) = \theta x^{\theta-1}, 0 < x < \theta, \theta > 0$. Find a complete sufficient statistic for θ .	[10]

Lower-Tailed Test		Upper-Tailed Test		Two-Tailed Test	
α	Z	α	Z	α	Z
0.10	-1.282	0.10	1.282	0.20	1.282
0.05	-1.645	0.05	1.645	0.10	1.645
0.025	-1.960	0.025	1.960	0.05	1.960
0.010	-2.326	0.010	2.326	0.010	2.576
0.005	-2.576	0.005	2.576	0.001	3.291
0.001	-3.090	0.001	3.090	0.0001	3.819
0.0001	-3.719	0.0001	3.719		

$$\phi = -\frac{\eta}{\theta} \left(1 + \frac{x}{\theta} \right)$$

$$\frac{\partial}{\partial} \left(-\frac{\bar{x}}{\partial^2} \right) + n\bar{x} = 4.05, \quad \alpha = 0.05$$

$$\frac{2}{32}g \times 10^{-3}$$

CENTRAL UNIVERSITY
School of Earth Sciences
Department of Environmental Science

End Semester Examination, Session 2023-24

12+8=101
Programme : Integrated M.Sc.

Course Code : ENV201

Course Title : Environmental Studies

Course Credit : 3

Semester : III
Maximum Marks : 60
Time Allowed : 3 Hrs.
Total Printed Pages : 1

Instructions to Candidates

1. All questions given below are compulsory.

- | No. | Question | Marks |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1. | Write a detailed note on the importance of natural resources.

OR
Explain the biological, physical and social components of the environment. | [10] |
| 2. | Write an overview on global water resources. Explain the water pollution and its adverse effects.

OR
Describe the biogeographic regions of India. | [10] |
| 3. | What is climate change? Explain global warming and its effects in detail.

OR
Describe the benefits and adverse effects of a dam in detail. | [10] |
| 4. | What is biodiversity? Explain the global patterns of the biodiversity.

OR
Explain the energy flow in a forest ecosystem. Explain different energy flow models. | [10] |
| 5. | What are biogeochemical cycles? Explain carbon and water cycle in detail.

OR
Explain the in-situ and ex-situ conservation of biodiversity. | [10] |
| 6. | Discuss the multidisciplinary nature of environmental studies with its need for the awareness quoting different branches/disciplines.

OR
Explain the impacts of anthropogenic activities on the environment. | [10] |