



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

InSem Examination-II Summer 2025	
Exam Seat No.:	
Academic Year: 2024-2025	Semester: VI
Class: TY	Program: B.Tech
Branch Code: ADS/COM	Pattern: 2022
Name of Course: Theory of Computation	Course Code: COM223012
Max. Marks: 30	Duration: 1.15 Hrs.

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains TWO pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required but justify it.
4. Draw the neat, labelled diagrams, wherever necessary.
5. The last columns indicate the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

**Marks CO**

**Question No. 1**

1 a) Describe the following language over the input set  $A = \{a, b\}$  (3) CO1

i)  $L_1 = \{b, ba, ba^2\}$

ii)  $L_2 = \{b^n a^n \mid n \geq 1\}$

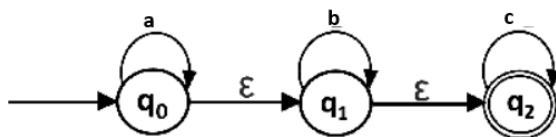
iii)  $L_3 = \{b^m a^n \mid n \geq 0\}$

1 b) Difference between Mealy and Moore machine (4) CO1

**Question No. 2**

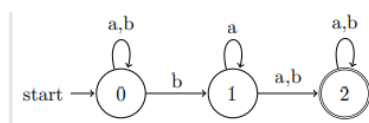
2 a) Design DFA that accepts string containing "aab" over  $\Sigma = \{a, b\}$  (4) CO1

2 b) Convert  $\epsilon$ -NFA to DFA (4) CO1



**Group OR**

2 c) Convert NFA to DFA (4) CO1



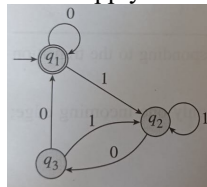
2 d) Design a Moore machine that accepts strings starting with '11'. Consider output set =  $\{y, n\}$  (4) CO1

**Question No. 3**

- 3 a) Apply the pumping lemma theorem to prove language  $L(r) = \{ a^n b^n \mid n > 0 \}$  is non-regular (3) CO2
- 3 b) Write regular expressions for the following languages over the alphabet  $\Sigma = \{a, b\}$  (4) CO2
- 1) The set of all strings ending either with "b" or with "a"
  - 2) The set of strings over  $\{0,1\}$  that contains at most two "a"
  - 3) The set of all strings over  $\{0,1\}$  ending with 00 and beginning with 1.

**Question No. 4**

- 4 a) Convert Regular expression to NFA with  $\epsilon$ -moves (4) CO2
- $r = (ab + ba)^* aa$
- 4 b) Convert given DFA to obtain Regular expression apply Arden's theorem. (4) CO2

**Group OR**

- 4 c) Explain closure properties for regular languages (4) CO2
- 4 d) Describe in English sets denoted by following regular expressions. (4) CO2
- i)  $(0/1)^* \cdot 0$
  - ii)  $(a/b)^* \cdot a \cdot b$
  - iii)  $a \cdot a \cdot (a+b)^+$
  - iv)  $(0+1) \cdot (0+1)^* \cdot (0/1)$

..... End of question paper.....