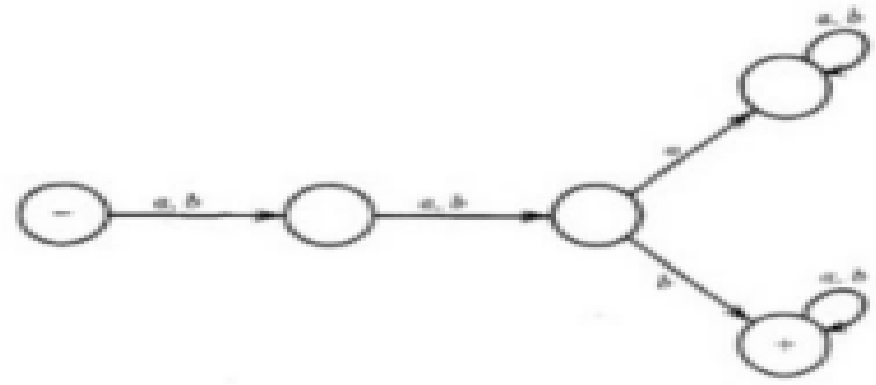
Question 1 **[15 Mark]**

[CLO 1]

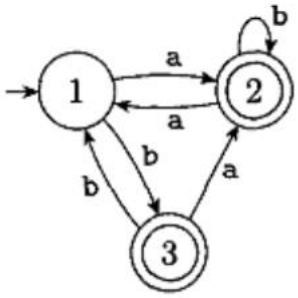
1) **Describe** DFA by using the regular expressions below. **(2 marks)**

(aab + abb + bab + bbb)(a + b)*

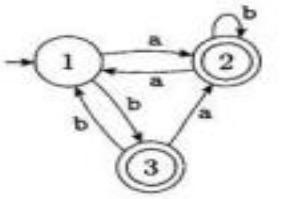
Solution:



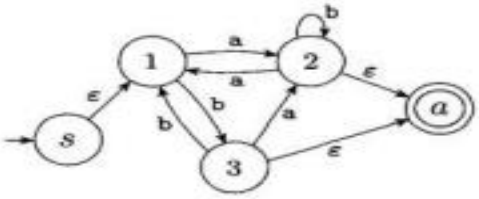
2) **Explain** the regular expression from the following DFA **(3 marks)**



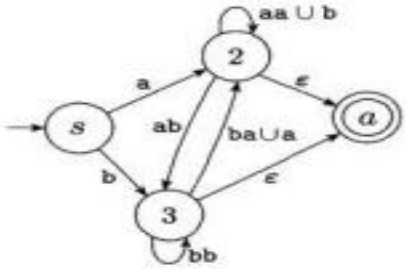
Solution:



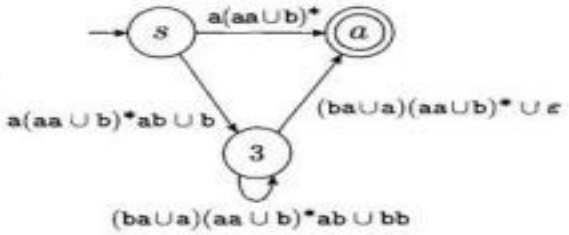
(a)



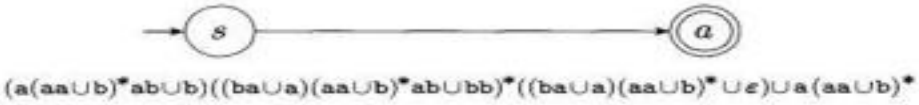
(b)



(c)

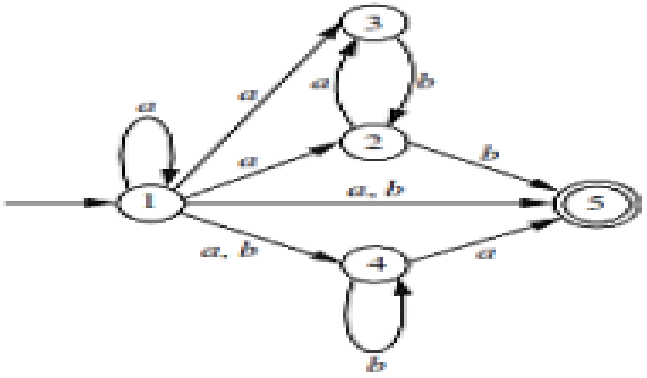


(d)



(e)

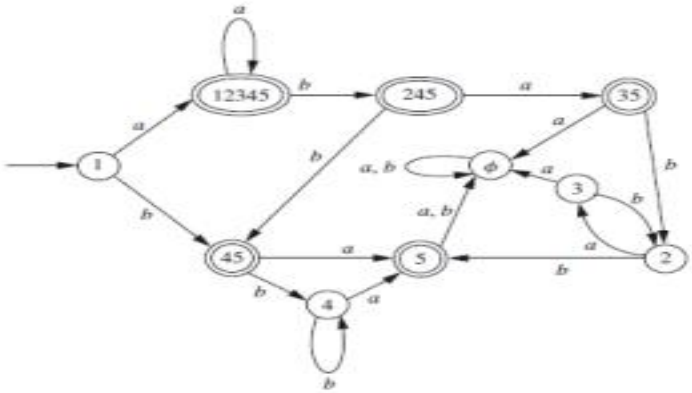
3) Define an appropriate DFA for the NFA provided below. **(5 marks)**



Solution:

DFA Transition Table

State	a	b
→ {1}	{1, 2, 3, 4, 5}	{4, 5}
{1, 2, 3, 4, 5}	{1, 2, 3, 4, 5}	{2,4, 5}
*{4, 5}	{5}	{4}
*{2, 4, 5}	{3,5}	{4,5}
*{5}	∅	∅
{4}	{5}	{4}
{3, 5}	∅	{2}
{2}	{3}	{5}
{3}	∅	{2}
∅	∅	∅



4) Compute the corresponding DFA for the given NFA. **(5 marks)**

Solution:

Note: **Start State**: A **Final States**: B, C, D and E

Transition Table

DFA states	NFA States	Transition on 0	Transition on 1
A	{q0}	{q0,q1}	{q1}
B	{q0,q1}	{q0,q1,q2}	{q1,q2}
C	{q1}	{q2}	{q2}
D	{q0,q1,q2}	{q0,q1,q2}	{q1,q2}

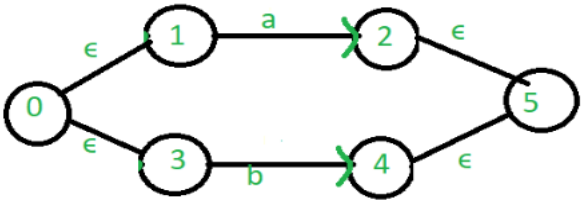
E	{q1,q2}	{q2}	{q2}
F	{q2}	∅	{q2}
G	∅	∅	∅

Question 2 **[10 Marks]**

[CLO 2]

1) **Design** a DFA from the following NFA with null starting state is '0' and final state is '5'

(5 marks)



Solution:

DFA Transition Table

State	a	b
→ {0, 1, 3}	{2, 5}	{4, 5}
{1}	{2, 5}	∅
*{2, 5}	∅	∅
{3}	∅	{4,5}
*{4, 5}	∅	∅
*{5}	∅	∅
{∅}	∅	∅

2) a) **Use** the language L = { $a^i b^j c^k$ | i,j,k≥0 and i=j=k} to proof is regular or not. **(2 marks)**

b) **Identify** *why the language L = {* $a^n b^n c^n$ | n ≥2^n*} is not regular.** **(3 marks)**

Solution:

a) Not the Regular Language

b) Not the Regular Language