B.Sc. Engg. CSE 7th Semester — 15 March 2018 (Afternoon)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION — **WINTER SEMESTER, 2017-2018**

DURATION: 1 Hour 30 Minutes — **FULL MARKS: 75**

CSE 4703: Theory of Computing

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

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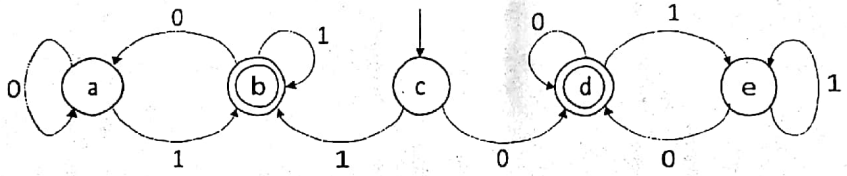
1. a) Consider a finite automaton $A = (Q, \Sigma, \delta, q_0, F)$. Explain the meaning of the elements of the 5-tuple. Explain δ for both DFA and NFA. 6

   b) Identify the elements of A from the following state diagram. 5



   c) Explain the language of the automaton of above diagram. 4

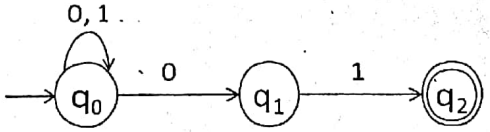
   d) Design an NFA to recognize *abc*, *abd* and *aacd* over the alphabet $\{a, b, c, d\}$. 10

2. a) State the differences between a DFA and an NFA. 4

   b) Give DFA of the set of strings that either begin or end (or both) with 01. 6

   c) What are the operators of regular expression? Mention the order of precedence followed by the operators. 3+2

   d) The following diagram is an NFA accepting all strings that end in 01. Describe the states the NFA is in during the processing of input sequence 00101 (with diagram). 10



3. a) Define Regular Expression. 2

   b) What is the difference between the strings and the words of a language? 3

   c) Convert the regular expression (0+1)01 to an NFA. 6

   d) Convert the following NFA to a DFA and informally describe the language it accepts. 14

	0	1
→ p	{q, s}	{q}
*q	{r}	{q, r}
r	{s}	{p}
*s	∅	{p}

4. a) Give formal description of the following regular expressions. 2×4

   i. $\sum^*001\sum^*$

   ii. $(0^*1^*)^*000(0+1)^*$

   b) Write a regular expression for the set of strings over alphabet $\{a, b, c\}$ containing at least one a and at least one b. 5

   c) Convert the following DFA to a regular expression, using the state elimination technique. 12

	0	1
→ * p	s	p
q	p	s
r	r	q
s	q	r