KOHAT UNIVERSITY OF SCIENCE & TECHNOLOGY
INSTITUTE OF COMPUTING

CS311 – Theory of Automata
Course Instructor: Dr. M. Irfan Uddin

Program: **BSCS/MCS**	**FINAL EXAM (OPEN BOOK)**	Semester: **Fall-2020**
Section: **A &B**	Max Marks: **50**	Max Time Allowed: **24 hrs.**

INSTRUCTIONS:

- This is an open book exam. The students can get help/guidance from books, tools, online media, and class notes if any.
- Ensure to write the complete information, i.e. Reg No., Name, Subject, etc, on each and every answer sheet.
- The solution must be purely handwritten, no printed pages will be accepted.
- Use appropriate size papers as answer sheets.
- The exam will start at 9:00 AM sharp and the soft copy of the answer sheets must be submitted within 24 hours.
- In the first phase, the students must take scans/pictures of their answer sheets and prepare a PDF file. This file must be submitted through the KCMS. However, in case of any justified technical issue, the students are allowed to send their solved papers on the official email of their instructor.
- In the second phase, the students must send their answer sheets through the courier/postal services to:

  Dr. M. Irfan Uddin, Institute of Computing,
  Kohat University of Science and Technology, Jerma,
  Kohat 26000, KPK

- The handwritten answer sheets must be received by March 02, 2021 (Monday) 4:00 PM after the submission of soft copy.
- The students can also submit their answer sheets by hand to the office of their instructor.
- Any late submission of both soft and/or hard copies, will not be accepted and the course instructor will award an 'I' grade to such students.
- After receiving the the orginional hand written answer sheets, the instructor will verify as to whether the hard copy is the same as the submitted soft copy. In case of any variation, the paper will be considered null and void.
- In case of any query, the students can contact their course instructor on **03355764514** or irfanuddin@kust.edu.pk. However, only text/WhatsApp messages will be allowed. To ensure transparency, no voice calls are permissible.

Question 1: Write regular expression for languages given below [10 Marks]

(a) Find regular expression for language L defined over Σ = {a, b}, that consists of zero or more a's followed by one or more b's followed by zero or more a's.

(b) Find regular expression for language L defined over Σ = {a, b}, that consists of repeated substring ab's.

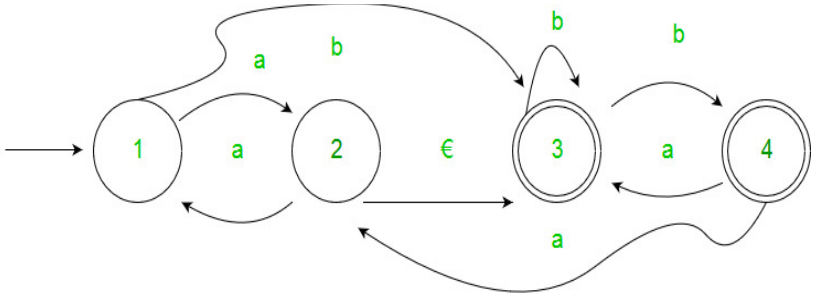
Question 2: Consider languages given below [10 Marks]

(a) Build Deterministic Finite Automata for language L defined over Σ = {0, 1}, consisting of even number of 0's followed by a single 1.

(b) Build Transition Graph for the languages defined in (a) above.

Question 3: Kleene's theorem. [10 Marks]

(a) Consider the Finite Automata given below, determine its regular expression using Kleene's theorem.



(b) Consider the regular expression given below, build its corresponding NFA-λ using Kleene's theorem.
$0^*1 + 10$

Question 4: [10 Marks]

Consider the regular expression (0 + 1)* (10), build the corresponding Nondeterministic Finite Automata. Then convert the resultant NFA to its corresponding Deterministic Finite Automata.

Question 5: Build Finite Automata with output for languges given below [10 Marks]

(a) Build Moore machine for language L defined over Σ = {0, 1}, where 1 is printed if even number of 1's is found in the input string and 0 is printed if odd number of 1's is found in the input string. Once you build the machine process the input string 11001101 and show the output produced by the machine.

(b) Build Mealy machine for language defined over input Σ = {0, 1}, that prints 'A' if the input string is termined by 00 and prints 'B' if the input string is terminated by 11. 'C' is printed otherwise. Process the following input strings and show the output. i. 1110100, ii. 1011011, iii. 101010