



CRAWFORD UNIVERSITY FAITH CITY IGBESA
COLLEGE OF NATURAL AND APPLIED SCIENCES
DEPARTMENT OF COMPUTER AND MATHEMATICAL SCIENCES
HARMATTAN SEMESTER EXAMINATION

**COURSE CODE: CSC 309 COURSE TITLE: AUTOMATA THEORY, FORMAL
LANGUAGES AND COMPUTABILITY**

UNITS: 2

SESSION: 2018/2019

Instructions:

- ❖ Use your matriculation number as the only means of identification on your answer script.
 - ❖ ANSWER ALL TWENTY (20) QUESTIONS IN THE OBJECTIVE SECTION
 - ❖ ANSWER QUESTION ONE (1) AND ANY OTHER TWO (2) QUESTIONS IN PART B (THEORY SECTION)
 - ❖ PART A: OBJECTIVE SECTION (20 marks)
 - ❖ TIME ALLOWED – TWO (2) HOURS
1. An example of light switch has the following states except (a) off (b) low (c) intermediate (d) high
 2. In _____, there is exactly ____ state transition for every input symbol state pair (a) PT/2 (b) DSM/1 (c) DSM/2 (d) PT/1
 3. 0 stands for ____ state (a) off (b) on (c) medium (d) high
 4. 1 stands for ____ state (a) off (b) on (c) medium (d) high
 5. S_p stands for (a) Senior Parser (b) State parsing tree (c) Present state (d) Past state
 6. S_i stands for (a) Initial state (b) Initial set (c) Systems International (d) Initial structure
 7. S_f stands for (a) State finite (b) finite state (c) final state (d) final structure

In DSM, use the following parameters to complete the Transition table below

Present State	Next state of Input 0	Next state of input 1
p	8. (a) p (b) q (c) r (d) s	9. (a) p (b) q (c) r (d) s
q	10. (a) p (b) q (c) r (d) s	11. (a) p (b) q (c) r (d) s
r	12. (a) p (b) q (c) r (d) s	13. (a) p (b) q (c) r (d) s
s	14. (a) p (b) q (c) r (d) s	15. (a) p (b) q (c) r (d) s

In NDSM, use the following Parameters to complete the transition table below:

Present state	Next state of input 0	Next state of input 1
e	16. (a) ef (b) fg (c) gf (d) fe	17. (a) e (b) f (c) g (d) ef
f	18. (a) e (b) f (c) g (d) ef	19. (a) ef (b) ge (c) fg (d) eg
g	20. (a) ef (b) ge (c) fg (d) eg	

PART B (THEORY SECTION)

QUESTION ONE (20 MARKS)

a. (i) Describe the term Ambiguity in Context-Free Grammars. (2 marks)

(ii) Check whether the grammar G with production rules

$$X \rightarrow X + X / X * X / a$$

is ambiguous or not. (2 marks)

b. (i) Highlight and analyse the two (2) different ways to define PDA acceptability. (2 marks)

(ii) Construct a PDA that accepts

$$L = \{0^n 1^n / n \geq 0\} \text{ (2 marks)}$$

c. Consider the following grammar production rules

$$S \rightarrow AB/AC$$

$$A \rightarrow aAb/bAa/a$$

$$B \rightarrow bbA/aaB/AB$$

$$C \rightarrow abCA/aDb$$

$$D \rightarrow bD/aC$$

Write out the useful symbols only. (1 mark)

d. With the aid of an illustration, define a finite-state machine. (2 marks)

(i). Let S_p = Present state = [a,b,c]

$$\epsilon = \text{number of states} = [0,1]$$

$$S_i = \text{Initial State} = [a]$$

$$S_f = \text{Final state} = [c]$$