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By K B Hemanth Raj

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AUTOMATA THEORY AND COMPUTABILITY

[As per Choice Based Credit System (CBCS) scheme]

(Effective from the academic year 2017 -2018)

SEMESTER – V

Subject Code **17CS54** IA Marks **40**

Number of Lecture Hours/Week **04** Exam Marks **60**

These Questions are being framed for helping the students in the "FINAL Exams" Only (Remember for Internals the Question Paper is set by your respective teachers). Questions may be repeated, just to show students how VTU can frame Questions.

- **ADMIN**

Module 3

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1. Define Grammar, Derivation, Sentential forms and give one example for each. (3-Marks) (5a) (Dec.2017/Jan.2018)

2. What is CNF? Obtain the following grammar in CNF

S → ASB | ε

A → aAS | a

B → SbS | A | bb (9-Marks) (5b) (Dec.2017/Jan.2018)

3. Let G be the grammar,

S → aB | bA

A → a | aS | bAA

B → b | bS | aBB

For the string aaabbabbba find a

i. Left most derivation

ii. Right most derivation

iii. Parse tree. (4-Marks) (5b) (Dec.2017/Jan.2018)

4. Explain the following terms:

i. Pushdown automata (PDA).

ii. Languages of a PDA.

iii. Instantaneous description of a PDA. (3-Marks) (6a) (Dec.2017/Jan.2018)

5. Construct a PDA to accept the language **L= { $\omega\omega^R$ | $\omega \in \{a, b\}^*$ }**. Draw the graphical representation of this PDA. Show the moves made by this PDA for the string aabbaa. (10-Marks) (6b) (Dec.2017/Jan.2018)

6. Convert the following CFG to PDA

S → aABB | aAA

A → aBB | a

B → bBB | A

C → a (10-Marks) (6c) (Dec.2017/Jan.2018)

7. Define a context-free grammar. Obtain the grammar to generate the language L = {w | n_a (w_ = n_b (w)} (4-Marks) (5a) (June/July 2018)

8. For the regular expression (011+1)* (01)* obtain the context free grammar. (4-Marks) (5b) (June/July 2018)

9. What is ambiguity? Show that the following grammar is ambiguous.

S → aB|bA

A → aS|bAAl|a

B → bS|aBB|b. (8-Marks) (5c) (June/July 2018)

10. Define PDA {Push Down automata). Obtain, a PDA to accept the language L(M) = {wCw^R | wt(a + b)*}, where WR is reverse of W by a final state. (8-Marks) (6a) (June/July 2018)

11. For the grammar:

S → aABB|aAA

A → aBBla

B → bBB| A

C → a

Obtain the corresponding PDA. (4-Marks) (6b) (June/July 2018)

12. Obtain a CFG for the PDA shown below:

$f(q_0, a, Z) = (q_0, AZ\}$

$f(q_0, a, A) = (q_0, A\}$

$f(q_0, b, A) = (q_1, \varepsilon)$

$f(q_1, \varepsilon, Z) = (q_2, \varepsilon)$ (4-Marks) (6c) (June/July 2018)

13. State and prove pumping lemma for context free languages. Show that L = $\{a^n b^n c^n \mid n \geq 0\}$ is not context free. (10-Marks) (7a) (Dec.2018/Jan.2019)

14. Explain Turing machine model. (6-Marks) (7b) (Dec.2018/Jan.2019)

15. Design a Turing machine to accept the language L = $\{0^n 1^n 2^n \mid n \geq 1\}$ (8-Marks) (8a) (Dec.2018/Jan.2019)

16. Design a Turing machine to accept strings of a's and b's ending with ab or ba. (8-Marks) (8b) (Dec.2018/Jan.2019)

17. Define PDA. What are languages of PDA? Construct the PDA to accept language L.

L=$\{w\ c\ w^R / w\ \varepsilon\ (a+b)\}$ where w^R is reverse of w. Show the moves made by PDA for string "aabcbaa". (10-Marks) (5a) (Dec.2018/Jan.2019|10 Scheme)

18. Obtain the PDA for the grammar

S→aABC

A→aB|a

B→bA|b

C→a (5-Marks) (5c) (Dec.2018/Jan.2019|10 Scheme)

19. Explain the working of PDA with a diagram (5-Marks) (5a) (June/July.2017|10 Scheme)

20. Convert the following CFG to an equivalent PDA.

S → aA

A → aABC|bB|a

B→b

C→c (5-Marks) (Dec.2016/Jan.2017|10 Scheme)

21. Design a PDA for accepting the Language L = { 02^n1^n | n>=1}. Draw the transition diagram for PDA obtained. Show the instantaneous description of the PDA for the String "000011" (10-Marks) (5b) (June/July.2016|10 Scheme)

22. Convert the following grammar to PDA

L → a|b|la|lb|l0|l1

E → 1|E*E|E+E|(E). (5-Marks)
(June/July.2016|10 Scheme)

ANSWER SCRIP FOR THESE QUESTIONS WILL BE UPLOADED ASAP

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THANK YOU
