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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 4

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1. If L_1 and L_2 are context free languages then prove that $L_1 \cup L_2$, $L_1 . L_2$ and L_1^* are context free Languages. (4-Marks) (7a) (Dec.2017/Jan.2018)

2. Give a decision procedure to answer each of the following questions:

i. Given a regular expression α and a PDA M, the language accepted by M a subset of the language generated by α?

ii. Given a context-free Grammar G and two strings S_1 and S_2, does G generate S_1S_2?

iii. Given a context free Grammar G, does G generate any even. Length strings.

iv. Given a Regular Grammar G, is L(G) context-free? (12-Marks) (7b) (Dec.2017/Jan.2018)

3. Explain with neat diagram, the working of a Turing Machine model. (5-Marks) (8a) (Dec.2017/Jan.2018)

4. Design a Turing machine to accept the language L = { a^n b^n c^n | n>=1 }. Draw the transition diagram. Show the moves made by this Turing machine for the string aabbcc. (11-Marks) (8b) (Dec.2017/Jan.2018)

5. Consider the grammar

S → 0A|IB

A → 0AA|1S|1

B → 1BB|0S| 0

Obtain the grammar in CNF. (8-Marks) (7a) (June/July 2018)

6. Show that L={ a^n b^n c^n | n>=0} is not context free. (8-Marks) (7b) (June/July 2018)

7. With a neat diagram, Explain the working of a basic Turing machine. (4-Marks) (8a) (June/July 2018)

8. Obtain a Turing machine to accept the language L = { 0^n 1^n | n>=1}. (8-Marks) (8b) (June/July 2018)

9. Briefly explain the techniques for TM construction. (4-Marks) (8c) (June/July 2018)

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

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

12. Design a Turing machine to accept the language L = { 0^n 1^n 2^n | n<=1 } (8-Marks) (8a) (Dec.2018/Jan.2019)

13. 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)

14. Define useless symbols, €-production and unit productions. Simplify the following grammar:

S → aA|a|Bb|cC

A → aB

B→a|Aa

C→cCD

D→ddd (8-Marks) (6a) (Dec.2018/Jan.2019|10 Scheme)

15. Define CNF. Convert the following Grammer to CNF

S→0A | 1B

A→0AA | 1S | 1

B→1BB | 0S | 0 (6-Marks) (6b) (Dec.2018/Jan.2019|10 Scheme)

16. Consider the following grammer

S → ASA|aB

A→B|S

B→b|E

i. Eliminate ε Production

ii. Eliminate any unit Production in the resulting grammar.

iii. Eliminate any useless symbols in the resulting grammar.

iv. Put the resulting grammar in to CNF. (10-Marks) (6a) (June/July.2017|10 Scheme)

17. Eliminate ε, unit and useless production from the following grammar and put the resulting grammar into CNF

S→ABC|BaB

A→aA|BaC|aaa

B→bBb|a|D

C→CA|AC

D→ε (12-Marks) (Dec.2016/Jan.2017|10 Scheme)

18. Eliminate the useless symbols and productions from the following grammar.

S → AB|AC

A → aA|bAa|a

B → bbA|aB|AB

C → aCa|aD

D → aD|bC (7-Marks) (6a) (June/July.2016|10 Scheme)

19. Define CNF and convert the following grammar into CNF.

S → Aba

A → aab

B → Ac (6-Marks) (6b) (June/July.2016|10 Scheme)

20. Prove that the family of context-free language is closed under union, concatenation and star-closure. (7-Marks) (6c) (June/July.2016|10 Scheme)

21. Consider the following Grammar

S → ASA|aB

A → B|S

B → b|E

i. Eliminate ε Production

ii. Eliminate any unit Production in the resulting grammar.

iii. Eliminate any useless symbols in the resulting grammar.

iv. Put the resulting grammar in to CNF. (10-Marks) (6a)

22. Prove that CFL are closed under union operation. (4-Marks) (6c) (Dec.2015/Jan.2016|10 Scheme)

THANK YOU
