

**AUTOMATA THEORY AND LANGUAGES**

Paper : 4:4

( Old Course )

Full Marks : 80

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

1. (a) State true or false: 1×5=5

- (i) A DFA has a finite set of states
- (ii) We cannot convert a DFA to a regular expression
- (iii) The union of two regular languages is not regular
- (iv) CFL's are closed under intersection
- (v) A CFG describes a language by recursive rules.

(b) Fill in the blanks: 1×5=5

- (i) A PDA is a \_\_\_\_\_ finite automaton.

- (ii) Grammar with almost one variable at the right side of a production is called \_\_\_\_\_.

- (iii) A \_\_\_\_\_ is away of describing languages by recursive rules called productions.

- (iv) \_\_\_\_\_ data structure is used in PDA.

- (v) The complement of a regular language is \_\_\_\_\_.

2. Define the following terms: 2×10=20

- (i) Finite Automata
- (ii) Right-linear grammar
- (iii) Context free language
- (iv) Ambiguity in grammar
- (v) Useless production
- (vi) Unit-production
- (vii) DPDA
- (viii) Normal form
- (ix) Parse tree
- (x) Pigeonhole principle.

3. Answer **any four** of the following: 5×4=20

- (a) Construct NFA for the regular expression  $01^* + 1$ .
- (b) Show that  $L = \{a^x : x \text{ is a prime number}\}$  is not regular.
- (c) Prove that union of two regular sets is also regular.
- (d) Show that the language  $L = \{a^i b^j c^i : i > 0\}$  is not context free.
- (e) Let  $\Sigma = \{a, b\}$ . Draw the transition diagram of a finite state automaton that accepts the given set of strings having odd number of a's.
- (f) Construct a PDA to accept a given language  $L$  by final state where  $L = \{a^n b^n : n \geq 1\}$
- (g) Explain the acceptance of PDA with empty stack and final stack.

4. Answer **any three** questions: 10×3=30

- (a) Briefly describe the operators of regular expression.

- (b) Write algorithms for deciding whether a regular language is infinite and equal.

- (c) Let  $G$  be

$$S \rightarrow AB$$

$$A \rightarrow a$$

$$B \rightarrow C$$

$$B \rightarrow b$$

$$c \rightarrow D$$

$$D \rightarrow E$$

$$E \rightarrow a$$

Eliminate Unit production and get an equivalent grammar.

- (d) Let  $G$  be the grammar

$$S \rightarrow aB | bA$$

$$A \rightarrow a | aS | bAA$$

$$B \rightarrow b | bS | aBB$$

For the string aaabbabbba, find

- (i) left most derivation
- (ii) right most derivation
- (iii) parse tree.

- (e) Define Chomsky Normal form and Greibach Normal form.

2017

**COMPUTER NETWORK**

Paper : 5-3

(Old Course)

Full Marks : 80

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

**PART-A**

1. Multiple Choice Questions : 1×10=10

- (i) The transmission mode that allows both communicating devices to transmit and receive data simultaneously is \_\_\_\_\_
- (a) Simplex
  - (b) Full-Duplex
  - (c) Half-Duplex
  - (d) None of the above.

- (ii) LAN stands for \_\_\_\_\_
- (a) Local Area Network
  - (b) Loaded Area Network
  - (c) Leak Area Network
  - (d) None of the above.
- (iii) MAN stands for \_\_\_\_\_
- (a) Metrological Area Network
  - (b) Metropolitan Area Network
  - (c) Main Area Network
  - (d) None of the above.
- (iv) WAN stands for —
- (a) Whole Area Network
  - (b) Ward Area Network
  - (c) Wide Area Network
  - (d) None of the above.
- (v) HUB operates in the \_\_\_\_\_ layer
- (a) Physical
  - (b) Datalink
  - (c) Both (a) and (b)
  - (d) None of the above.
- (vi) Router connects the nodes on \_\_\_\_\_ network
- (a) Same
  - (b) Different
  - (c) Both
  - (d) None
- (vii) Switch operates in the \_\_\_\_\_ layer
- (a) Datalink
  - (b) Transport
  - (c) Both
  - (d) None
- (viii) OSI is a \_\_\_\_\_ layer model
- (a) Four
  - (b) Five
  - (c) Seven
  - (d) None
- (ix) TCP/IP is \_\_\_\_\_ layer model
- (a) Four
  - (b) Five
  - (c) Seven
  - (d) None
- (x) ISP stands for \_\_\_\_\_
- (a) Internet Service Provider
  - (b) Internet Service Promoter
  - (c) Internet Service Provider
  - (d) None of the above.

**PART-B**

2. Answer **any five** questions : 2×5=10

- (a) Define Internet
- (b) What is a Computer Network ?
- (c) What is FTP ?
- (d) Define TCP/IP.
- (e) What is Data Communication ?
- (f) What is IEEE Standard ?

**PART-C**

3. Write short notes on : (**any five**) 4×5=20

- (a) Guided and Unguided Transmission Media
- (b) Wireless LANs
- (c) IPv4 addressing
- (d) UDP
- (e) Datatraffic and Conjestion
- (f) MAC Addressing
- (g) Analog and Digital Transmission
- (h) Socket and Port.

**PART-D**

Answer **any five** questions. 5×8=40

- 4. What is meant by the term 'Data Communication'? What are its components? What are the characteristics of Data Communication ? 2+3+3=8
- 5. Explain the different Data transmission modes in detail. 8
- 6. Define the term 'transmission media' ? Explain the different types of transmission media available. 2+6=8
- 7. What do you understand by the term 'Modulation' ? Explain the modulation techniques in detail. 2+6=8
- 8. Explain the Computer Networks in detail ? Mention some advantages of computer network. 6+2=8
- 9. Define Network topology ? Describe commonly used network topologies with their relative advantages and disadvantages. 1+7=8
- 10. Describe the OSI model in detail. 8
- 11. What is CSMA, CSMA/CD, CSMA/CA ? 8

12. Discuss the Leaky Bucket and Token Bucket Algorithm. 4+4=8

13. What is Error Correcting (Hamming Code) Code and Error Detecting Code (CRC). 4+4=8

14. Write descriptive notes on : 2×4=8

- (a) Telnet
- (b) DNS
- (c) WWW
- (d) SMTP.

**2017**  
**MICROPROCESSOR AND ASSEMBLY  
LANGUAGE PROGRAMMING**

Paper : 4-1

Full Marks : 80

Time : Three hours

*The figures in the margin indicate  
full marks for the questions.*

1. What are different flags available in the flag register? Mention the role played by each of them. 6
2. Distinguish between one byte and two byte instruction. 4
3. What is SIM and RIM instruction? 2
4. Distinguish between Data Bus and Address Bus. 4
5. Draw the pin diagram of 8085 microprocessor and explain the function of each pin. 5
6. What are the different modes supported by 8255 PPI? Mention them and also indicate what role each mode performs. How the 8255 PPI is configured for different modes? 8
7. Specify the four control signals commonly used by the 8085 MPU. 4
8. Explain why a latch is used for an output port, but a tri-state buffer can be used for an input port. 4
9. What is an interrupt? Explain various types of interrupt. 6
10. Write assembly language program : (**any two**) 5×2=10
  - (a) To convert a BCD number into a binary number.
  - (b) To subtract two packed BCD numbers.
  - (c) To clear the contents of 100 bytes of data in consecutive memory location.
11. Write a subroutine to set the Zero flag and check whether the instruction JZ functions properly or not, without modifying any register contents other than flags. 7
12. Write short notes on the following : (**any four**) 5×4=20
  - (a) Subroutine
  - (b) Addressing modes
  - (c) Absolute and partial Decoding
  - (d) Tri-state devices
  - (e) Seven Segment display.