

Q.P. Code: 40985

(3 Hours)

[Total Marks: 80]

N.B.: (1) Question No. 1 is compulsory.

(2) Solve any **three** questions out of remaining **five**.

(3) Figures to **right** indicate **full** marks.

(4) Assume suitable **data** where **necessary**.

1. Solve any four out of five sub questions. [04 x 05=20]
- a) Explain Von-Neumann Architecture.
  - b) Draw and explain 6 stage instruction pipeline.
  - c) What are the various functions performed by I/O module?
  - d) Differentiate between RISC & CISC.
  - e) Represent  $(15.125)_{10}$  in IEEE 754 single precision floating point standard.
- Q. 2. a) Multiply (-5) and (2) using Booth's Algorithm. 10
- b) Discuss various pipeline hazards with example. 10
- Q. 3. a) Explain the register organization of a CPU. 10
- b) Consider the string 8, 3, 9, 4, 9, 8, 5, 8, 3, 9, 6, 7, 5, 4, 3, 9, 4, 9, 3 10
- Find the page faults for 3 frames using FIFO, Optimal, & LRU page replacement policies.
- Q. 4. a) Divide 18 by 5 using restoring division algorithms. 10
- b) Explain Flynn's classification in detail. 10
- Q. 5. a) Discuss the various characteristics of Memory. 10
- b) Explain design of control unit w.r.t. micro-programmed and hardwired approach. 10
- Q. 6. a) Explain different addressing modes with example. 10
- b) What is the need of DMA? Explain its various techniques of data transfer. 10
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23/05/2018

Q.P.Code:09965

Duration: 3 hours

Total marks: 80

- N.B. (1) Question No. 1 is compulsory.  
 (2) Solve any three questions from remaining questions.  
 (3) Draw suitable diagrams wherever necessary.  
 (4) Assume suitable data, if necessary.

Q.1 Attempt any four sub-questions.

- State and explain closure properties of regular language.
- Design a Moore machine to convert each occurrence of 100 to 101.
- Give formal definition of a Push Down Automata.
- Let G be the grammar. Find the leftmost derivation, rightmost derivation and parse tree for the string 001222.

G:  $S \rightarrow 0S \mid 1A \mid 2B \mid \epsilon$

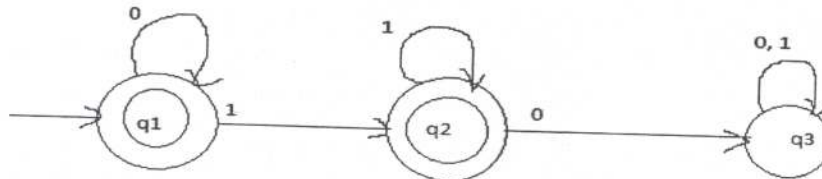
$A \rightarrow 1A \mid 2B \mid \epsilon$

$B \rightarrow 2B \mid \epsilon$

- Give a regular expression for a language over the alphabet  $\Sigma = \{a, b\}$  containing at most two a's

- Design a DFA for the regular expression  $(a+b)^*aba$ .
- Design a Mealy machine over the alphabet  $\{0, 1\}$  which outputs EVEN, ODD according to the number of 1's encountered as even or odd.

Q3.a) Find a regular expression RE corresponding to the following FA



- Using pumping lemma prove that the following language is not regular

$L = \{ ww \mid w \in \{0, 1\}^* \}$

Q4.a) Design a PDA for recognizing the  $L = \{ a^m b^n c^{m+n} \mid m, n \geq 1 \}$ .

- Construct a TM accepting palindromes over  $\Sigma = \{a, b\}$ .

Q5. a) What is a Greibach Normal Form (GNF)? Convert the following CFG to GNF

$S \rightarrow Sab \mid Sba \mid \epsilon$

Turn Over



- b) Design a NFA for accepting input strings that contain either the keyword 000 or the keyword 010 and convert it into an equivalent DFA.

10

Q6. Write short notes on (any two)

20

- Variants of Turing Machines
- Recursive and Recursively enumerable language
- Chomsky Hierarchy
- Halting Problem
- Simplification of CFG.

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- N.B.:1) Question no.1 is compulsory.  
2) Attempt any three questions from Q.2 to Q.6.  
3) Use of statistical tables permitted.  
4) Figures to the right indicate full marks.

Maximum  
Marks

- Q1. a) Evaluate  $\int_C |z| dz$ , where C is the left half of unit circle  $|z| = 1$  from  $z = -i$  to  $z = i$ . [5]  
b) If  $A = \begin{bmatrix} 1 & 0 \\ 2 & 4 \end{bmatrix}$ , then find the eigen values of  $4A^{-1} + 3A + 2I$ . [5]  
c) If the tangent of the angle made by the line of regression of y on x is 0.6 and  $\sigma_y = 2\sigma_x$ , find the correlation coefficient between x and y. [5]  
d) Construct the dual of the following L.P.P. [5]

$$\begin{aligned} \text{Minimise } z &= x_2 + 3x_3 \\ \text{Subject to } 2x_1 + x_2 &\leq 3 \\ x_1 + 2x_2 + 6x_3 &\geq 5 \\ -x_1 + x_2 + 2x_3 &= 2 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

- Q2. a) Evaluate  $\int_C \frac{e^{2z}}{(z+1)^4} dz$ , where c is the circle  $|z - 1| = 3$ . [6]  
b) Show that the matrix  $A = \begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix}$  is derogatory. [6]  
c) For a normal variate with mean 2.5 and standard deviation 3.5, find the probability that (i)  $2 \leq X \leq 4.5$ , (ii)  $-1.5 \leq X \leq 5.3$ . [8]

- Q3. a) The daily consumption of electric power is a random variable X with probability distribution function  $f(x) = \begin{cases} kxe^{-\frac{x}{3}}, & x > 0 \\ 0, & x \leq 0 \end{cases}$  [6]  
Find the value of k, the expectation of k and the probability that on a given day the electric consumption is more than expected value.

- b) Solve the following L.P.P. by simplex method. [6]  
Maximise  $z = 4x_1 + 10x_2$   
Subject to  $2x_1 + x_2 \leq 10$   
 $2x_1 + 5x_2 \leq 20$   
 $2x_1 + 3x_2 \leq 18$   
 $x_1, x_2 \geq 0$

- c) Expand  $f(z) = \frac{2}{(z-1)(z-2)}$  in the regions (i)  $|z| < 1$  (ii)  $1 < |z| < 2$  (iii)  $|z| > 2$ . [8]

- Q4. a) The incidence of an occupational disease in an industry is such that the workers have 20% chance of suffering from it. What is the probability that out of 6 workers chosen at random 4 or more will be suffering from the disease? [6]

- b) Calculate the coefficient of correlation between X and Y from the following data. [6]

X	3	5	4	6	2
Y	3	4	5	2	6

- c) Show that the matrix  $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$  is diagonalizable. Find the transforming matrix M and the diagonal form D. [8]



Q5.a) Can it be concluded that the average life-span of an Indian is more than 70 years, if a random sample of 100 Indians has an average life span of 71.8 years with standard deviation 8.9 years? [6]

b) Evaluate  $\int_0^{2\pi} \frac{d\theta}{3+2\cos\theta}$ , using Cauchy's residue theorem. [6]

c) Using the Kuhn – Tucker conditions, solve the following N.L.P.P. [8]

$$\begin{aligned} \text{Maximise } z &= x_1^2 + x_2^2 \\ \text{Subject to } x_1 + x_2 - 4 &\leq 0 \\ 2x_1 + x_2 - 5 &\leq 0 \\ x_1, x_2 &\geq 0 \end{aligned}$$

Q6.a) A die was thrown 132 times and the following frequencies were observed. [6]

No obtained	1	2	3	4	5	6	Total
Frequency	15	20	25	15	29	28	132

Test the hypothesis that the die is unbiased.

b) Two independent samples of sizes 8 and 7 gave the following results. [6]

Sample 1	19	17	15	21	16	18	16	14
Sample 2	15	14	15	19	15	18	16	

Is the difference between sample means significant?

b) Using Penalty (Big-M) method solve the following L.P.P. [8]

$$\begin{aligned} \text{Maximise } z &= 3x_1 - x_2 \\ \text{Subject to } 2x_1 + x_2 &\leq 2 \\ x_1 + 3x_2 &\geq 3 \\ x_2 &\leq 4 \\ x_1, x_2 &\geq 0 \end{aligned}$$

ALL THE BEST!



17/5/2018

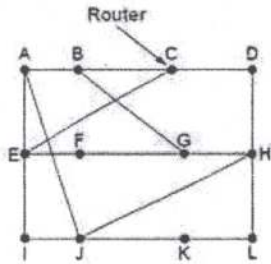
[Time: Three Hours]

[Marks: 80]

Please check whether you have got the right question paper

**N.B.:**

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|---|----|
| 1. Question number <b>ONE</b> is compulsory                               |    |
| 2. Attempt any <b>THREE</b> questions from question 2 to 6.               |    |
| 3. Figures to the right indicate full marks.                              |    |
| <hr/>   |    |
| Q. 1. Answer any <b>FOUR</b> from the following                           | 20 |
| a) Define Hub, Switch, Router, Bridge and Gateway                         |    |
| b) What is ALOHA? Explain different types of ALOHA                        |    |
| c) Why do HTTP and FTP run on top of TCP rather than on UDP?              |    |
| d) What is classful addressing? Explain difference classes of IP address. |    |
| e) Examine problems in Application Layer.                                 |    |
| <hr/>   |    |
| Q. 2 a) Compare OSI and TCP network models                                | 10 |
| Q. 2 b) Explain Peer-to-Peer Communication architecture.                  | 10 |
| <hr/>   |    |
| Q. 3 a) Create new routing table for node J using DVR                     | 10 |



To \ A	I	H	K
A	0	24	20
B	12	36	31
C	25	18	19
D	40	27	8
E	14	7	30
F	23	20	19
G	18	31	6
H	17	20	0
I	21	0	14
J	9	11	7
K	24	22	22
L	29	33	9

JA delay is 8      JI delay is 10      JH delay is 12      JK delay is 6

Vectors received from J's four neighbors

- |         |   |    |
|---------|---|----|
| Q. 3 b) | List various sliding window protocols. Explain any one in detail.                       | 10 |
| Q. 4 a) | Justify that the Go-Back-N protocol is good for network communications.                 | 10 |
| Q. 4 b) | Examine 2D Parity Code for error detection and correction                               | 10 |
| Q. 5 a) | What is congestion? How it can be avoided? Explain                                      | 10 |
| Q. 5 b) | List different protocols used at the boundary of AS. Explain any one of them in detail. | 10 |
| Q. 6.   | Answer any <b>FOUR</b> from the following   | 20 |
| a)      | Explain token bucket algorithm  |    |
| b)      | What is carrier sense? Hence, Differentiate between CSMA/CA & CSMA/CD.                  |    |
| c)      | List and explain any two framing methods  |    |
| d)      | Explain subnetting. Hence, explain how subnet mask is calculated?                       |    |
| e)      | Examine the advantages of LAN, WAN and MAN.   |    |

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