ICOE/Lib/SE/IT/Sem-IV/CoA/23/5/2024

Paper / Subject Code: 41025 / Computer Organization & Architecture

S.E / Info. Tech / Sem - IV / May - 24

28-05-24

[Time: 3 Hours] **[Total marks: 80]**

N.B. 1. Question No 1 is compulsory.
2. Solve any **three** questions out of the remaining five questions.
3. Assume suitable data if necessary.
4. Figures to the right indicate marks.

Q. 1. Solve any **four** out of five. (4*5=20)

a. Explain the working of D flip-flop.
b. With the help of a diagram, explain Von-Neumann's architecture.
c. Convert $(-20.25)_{10}$ in the IEEE 754 single precision floating point standard.
d. Describe the six stage instruction pipeline.
e. Draw the memory hierarchy and explain the same.

Q. 2. a) Draw the flowchart of Booth's Algorithm and multiply (-5) and (6) using the same. (10)

b) Explain half subtractor and full subtractor using truth table and circuit diagram. (10)

Q. 3. a) Reduce given Boolean expression using K-Map method.

$f(A,B,C,D) = \sum (0, 1, 2, 4, 5, 7, 8, 10, 11, 13, 15)$ (10)

b) Write an assembly language program for an 8086 microprocessor to find the even and odd numbers from the list of given ten, 8 bit binary numbers. (10)

Q. 4. a) Explain Set associative cache mapping technique with example. (10)

b) Describe 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. microprogrammed and hardwired approach. (10)

Q. 6. a) Explain different addressing modes of 8086 microprocessors with examples. (10)

b) Discuss the need of I/O module and explain its various I/O techniques in brief. (10)

S.E./Sem.IV/IT/May:2024

Paper / Subject Code: 41022 / Computer Network & Network Design

Ic 06/Lib/SE/SemIV/IT/CNND/16/5/24 Date: 16/05/2024

(3 Hours) (Total Marks: 80)

N.B.: (1) Question No.1 is compulsory.
(2) Attempt any three questions from the remaining five questions.
(3) Make suitable assumptions wherever necessary but justify your assumptions.

Q.1. Solve any four

a. Explain Repeater, Hub, Bridge, Switch, and Gateway. 05 M

b. Explain Token passing controlled access protocol. 05 M

c. Explain in detail Network Address Translation. 05 M

d. Compare connection oriented and connectionless lossy protocols. 05 M

e. Explain Image compression GIF and JPEG. 05 M

Q.2.a. Draw and Explain OSI reference model with neat diagram. 10 M

Q.2. b. Explain IPv4 header format with diagram. 10 M

Q.3.a. Explain CSMA protocols. Explain how collisions are handled in CSMA /CD. 10 M

Q.3.b. A bit stream 10110 is transmitted using the standard CRC method.
The generator polynomial is x^3+x^2+1. What is the actual bit string transmitted?
How will the receiver detect data received without any error? 10 M

Q.4.a.Explain following transmission media - Twisted pair, Coaxial Cable, Fiber Optic. 10 M

Q.4.b.Explain concept of sliding protocol? Compare the performance of Go-back-N and Selective Repeat protocol. 10 M

Q.5.a.What is IP addressing? Explain in detail Classful and Classless IP addresses. 10 M

Q.5.b. Explain in detail TCP congestion control mechanism. 10 M

Q.6.Write a short note on (Any four) 20 M

a. RPC
b. DNS
c. VLAN
d. SNMP
e. OSPF

IT06/Lib/SG/SemIV/IT/AT/24/05/2024

Paper / Subject Code: 41024 / Automata Theory

S.E./Sem.IV/IT/May.2024

24/05/24

Duration: 3 Hours **Total Marks: 80**

Note:- 1) Question No. 1 is Compulsory.
2) Solve any three out of remaining questions.

Q.1) Answer any **Four.**

a) Describe Moore machine with all tuples in detail. **(05)**

b) Find the Regular Expression corresponding to the grammar **(05)**

$S \rightarrow AB / AS$
$A \rightarrow a / aA$
$B \rightarrow b$

c) Construct mealy machine to accept all strings ending with 00 or 11. **(05)**

d) Write a note on Universal Turing Machine. **(05)**

e) Draw diagram for Chomsky hierarchy and Show all the types with proper explanation. **(05)**

Q.2)

a) Design NFA for accepting input strings that contain either the keyword 000 or the keyword 010 and convert it into an equivalent DFA . **(10)**

b) Design a DFA corresponding to regular expression (a+b)*aba (a+b)* **(10)**

Q.3)

a) What are Moore and Mealy machines? **(10)**
Design a Moore and Mealy machines to convert all occurrences of '1110' to '1011' over Σ {0, 1}.

b) Define CFG, obtain CFG for the following grammar **(10)**
(110+11)*(10)*

Q.4)

a) Construct a Turing machine accepting palindromes over ∑={a,b} **(10)**

b) Discuss power and limitations of PDA. Compare it with FA and TM. **(10)**

Q.5)

a) i) Define CFG. **(02)**

ii) Find the leftmost derivation, rightmost derivation and parse trees for the string "aaabbabbba" using CFG: **(08)**

$S \rightarrow aB / bA$
$A \rightarrow aS / bAA / a$
$B \rightarrow bS / aBB / b$

b) Construct NFA for Binary strings that begin with 11 and end with 11 or begin with 00 and end with 00 **(10)**

Q.6) Write short notes on any **TWO** **(20)**

i. Halting Problem in TM
ii. Greibach Normal Form (GNF)
iii. Applications of FM, PDA and Turing Machine with example

I COE/Lib/56/IT/Sem IV/05/21/05/2024

Paper / Subject Code: 41023 / Operating System

S.E / Info. Tech / sem-IV / May-2024

Date:- 21.05.24

Time: 3Hours

Total Marks: 80

N.B. 1) Question no.1 is compulsory
2) Solve any Three questions from remaining five.
3) Assume suitable data and draw diagram wherever required.

			Marks
Q1.		Attempt any four	
	a.	What are the various objectives and functions of Operating Systems?	5
	b.	Differentiate between process and threads.	5
	c.	Explain Race condition with example.	5
	d.	What is Demand Paging? What are its advantages?	5
	e.	What are features of Mobile and Real Time Operating Systems?	5
Q2.	a.	Give the explanation of necessary conditions for deadlock. Explain how a resource allocation graph determines a deadlock.	10
	b.	Consider the reference string7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1 and four free frames which are empty initially. How many page faults would occur for replacement by 1. LRU 2. FIFO 3. Optimal page replacement algorithms.	10
Q3.	a.	Explain RAID Level in Details	10
	b.	What is Internal fragmentation? Explain static partitioned allocation with partition sizes 400,180, 100, 300, and 45. Assuming First fit and Best fit method indicate thememory status after memory request for sizes 95, 180, 285, 380, 30.	10
Q4.	a.	Explain file allocation methods in detail with proper diagram.	10
	b.	What is a thread? How multithreading is beneficial? Compare and contrast different multithreading models.	10
Q5.	a.	Explain paging in detail. Describe how logical address is converted into physical address.	10
	b.	What is semaphore and its types? How the classic synchronization problem -Dining philosopher is solved using semaphores?	10

Q6. a. Consider the following set of processes with their burst times given below: 10

Process name	Burst Time(ms)	Arrival Time(ms)	Priority(smaller no=higher priority)
P1	24	0	5
P2	7	3	3
P3	6	5	2
P4	10	10	1

1.Draw the Gantt chart for FCFS, SJF, Priority(preemptive) , Round Robin(quantum=4)scheduling
2. Calculate average waiting time for each of the above algorithm.

b. What is open-source operating system? What are the design issues of Mobile operating system and Real time operating system? 10

(Time: 3 hours) Max. Marks: 80

N.B. (1) Question No. 1 is compulsory.
(2) Answer any three questions from Q.2 to Q.6.
(3) Use of Statistical Tables permitted.
(4) Figures to the right indicate full marks

Q1. (a) If matrix $A = \begin{bmatrix} -1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{bmatrix}$ find Eigen values of $A^3 + 5A + 8I$. [5]

(b) Evaluate the integral $\int_0^{1+i} (x - y + i x^2)\, dz$ along the parabola $y^2 = x$. [5]

(c) Find the z-transform of $f(k) = a^k,\ k \geq 0$. [5]

(d) Maximise $z = x_1 + 3x_2 + 3x_3$

Subject to $x_1 + 2x_2 + 3x_3 = 4$

$2x_1 + 3x_2 + 5x_3 = 7$ find all basic solutions. Which

of them are basic feasible, And optimal basic feasible solutions. [5]

Q2 (a) Verify Cayley- Hamilton theorem for the matrix A where $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$

And hence find A^{-1} and A^{-2}. [6]

(b) The means of two random samples of size 9 and 7 are 196.42 and 198.82 respectively

The sum of the squares of the deviations from the means are 26.94 and 18.73 respectively. Can

The samples be considered to have been drawn from same population? [6]

(c) Solve the L.P.P by using simplex method.

Maximise $z = 3x_1 + 2x_2$

Subject to $3x_1 + 2x_2 \leq 18$;

$0 \leq x_1 \leq 4$;

$0 \leq x_2 \leq 6$;

$x_1, x_2 \geq 0$. [8]

Q3 (a) Find the Laurent's series for

$F(z) = \frac{4z+3}{(z-3)\,z\,(z+2)}$ valid for $2 < |z| < 3$. [6]

(b) Using the method of Lagrange's multiplier solve the N.L.P.:

Optimise $z = 12\,x_1 + 8\,x_2 + 6x_3 - x_1^2 - x_2^2 - x_3^2 - 23$.

Subject to $x_1 + x_2 + x_3 = 10$. $x_1, x_2, x_3 \geq 0$. [6]

(c) Marks obtained by students in an examination follow normal distribution. If 30 % Of the students got below 35 marks and 10 % got above 60 marks. Find the mean and standard deviation. [8]

Q4 (a) Find the Eigen values and Eigen vectors of matrix $A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$ [6]

(b) Find inverse z- transform of $F(z) = \frac{3z^2 - 18z + 26}{(z-2)(z-3)(z-4)}$ $3 < |z| < 4$. [6]

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

Maximise $z = 12\,x_1x_2 + 2\,x_1^2 - 7\,x_2^2$

Subject to $2\,x_1 + 5x_2 \leq 98$;

$x_1, x_2 \geq 0$

Q5 (a) Show that the matrix $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalisable. Find the diagonal form D and the Diagonal zing matrix M. [6]

(b) Find the relative maximum or minimum of the function

$z = x_1^2 + x_2^2 + x_3^2 - 4x_1 - 8x_2 - 12x_3 + 100$. [6]

(c) Evaluate $\oint \frac{2z-1}{(2z+1)\,z\,(z+2)}\,dz$ using Cauchy's residue theorem, where C is the circle $|z| = 1$. [8]

Q6 (a) The number of car accidents in a metropolitan city was found to be 20, 17, 12, 6, 7, 15, 8, 5, 16 and 14 per month respectively. Use χ^2- test To check whether these frequencies are in agreement with that occurrence was The same during 10 months period. Test at 5 % level of significance. [6]

(b) Find z – transform of $[\, 2^k \cos(3k+2)\,]$, $k \geq 0$. [6]

(c) Use the dual simplex method to solve the L.P.P. [8]

Minimise $z = 2x_1 + x_2$

Subject to $3x_1 + x_2 \geq 3;$

$4x_1 + 3x_2 \geq 6;$

$x_1 + 2x_2 \leq 3;$

$x_1, x_2 \geq 0.$

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