WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 3rd Semester Examination, 2020, held in 2021

CMSACOR05T-COMPUTER SCIENCE (CC5)

DATA STRUCTURE

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

Answer Question No. 1 and any *four* from the rest

1. Answer any ***four*** questions from the following: 2×4 = 8

   (a) State the difference between linear and non-linear data structure.

   (b) What are the limitations of recursion?

   (c) In which situation linear search is advantageous than binary search?

   (d) What is "Saddle Point" of a matrix?

   (e) Each element of an array A[20][50] requires 4 bytes of storage. Base address of A is 2000. If the array is stored in column major order then find the location of A[10][10]?

   (f) Define ADT.

   (g) State the difference between internal sorting and external sorting techniques.

2. (a) Prove that a tree with n nodes has exactly $n-1$ edges. 4

   (b) Prove that $n_0 = n_2 + 1$, where n_0 is the number of leaf vertices, and n_2 is the number of vertices of degree 2 of a non-empty binary tree. 4

3. (a) What is BST? 2

   (b) Insert the following keys in the order given below to build them into an AVL tree. 6
   g, h, s, l, e, m, t, u.

   Clearly mention different rotations use and balance factor of each node.

4. (a) How can a polynomial such as $6x^6 + 5x^3 - 2x + 10$ be represented by a linked list. 2

   (b) Transform the following expression to the expression in Postfix notation: 4

   $$A * (B + D)/E - F * (G + H/K)$$

(c) Why is the Queue Data Structure called FIFO? 1

(d) The following sequence of operations is performed on a stack: 1

push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop.

What should be the sequence of popped out values?

5. Write the selection sort algorithm. Sort the following list of elements using selection sort and also calculate the number of comparisons required: 3+3+2

15 –31 23 –19 37 0 9 29

6. (a) Write the conditions for checking circular queue empty and circular queue full. 2+2

(b) What is a Sparse Matrix? Give a storage efficient method for storing a sparse matrix. 1+3

7. (a) Why the hash functions need to be simple? 2

(b) Define collision. Discuss two collision resolution techniques and compare their performances. 2+4

8. Write short notes on (any *two*): 4+4

(a) Collision resolution by quadratic probing

(b) Threaded binary trees

(c) Tail recursion.

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

——×——

WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 3rd Semester Examination, 2020, held in 2021

CMSACOR06T-COMPUTER SCIENCE (CC6)

OPERATING SYSTEM

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

Answer any *four* from Questions 1(a-g) 2×4 = 8

1. (a) Why SJF scheduling is called special case of Priority scheduling?

   (b) Explain batch system.

   (c) What is the need of Counting Semaphore while we are already having Binary Semaphore?

   (d) Explain the role of Process Control Block (PCB) for a process.

   (e) What is Belady's Anomaly?

   (f) What is virtual address space?

   (g) State the main difference between logical address and physical address.

Answer any *four* from Questions 2 to Questions 8 8×4 = 32

2. Explain CPU scheduling criteria. Consider the following set of processes: 2+6

Process	CPU Burst Time	Priority	Arrival time
P0	80	3	0
P1	20	1	10
P2	10	3	10
P3	20	4	80
P4	50	2	85

Draw the Gantt chart using RR (ts = 15) and for preemptive priority scheduling. Calculate the average waiting time.

3. (a) Define dead lock. 2

   (b) State and define the necessary conditions for deadlock occurrence. 4

   (c) What is safe state? 2

4. (a) Solve the producer-consumer problem by using counting semaphore. 5

(b) What is thrashing? 1

(c) Explain the two different ways of occurrences of external fragmentation for variable length partitions. 2

5. (a) What is Semaphore? 2

(b) What are the different types of semaphore? 3

(c) Explain starvation. 3

6. (a) State the difference(s) between Seek Time and Rotational Latency in Disk Scheduling. 2

(b) Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The head is initially at cylinder number 53 moving towards larger cylinder numbers on its servicing pass. The cylinders are numbered from 0 to 199. If SSTF scheduling algorithm is used then find the total head movement (in number of cylinders) incurred while servicing these requests. 4

(c) What is inode? 2

7. Consider the following reference string and find out the number of page faults for FIFO, LRU and Optimal Page Replacement algorithms assuming four page frames for each method. 8

7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1

8. (a) Why Paging is needed? 2

(b) If page size is 4 kb and logical address is 22 bit then find the number of entries in the page table. 2

(c) Four jobs are to be executed on a single processor system arrive at time 0 in the order A, B, C, and then D. Their CPU burst time are 400, 100, 800, and 100 nano-seconds respectively. If the CPU scheduling policy is Round Robin with time quantum of 200 nano-seconds, then calculate the average waiting time and average turn-around time. 4

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

——×——

WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 3rd Semester Examination, 2020, held in 2021

CMSACOR07T-COMPUTER SCIENCE (CC7)

COMPUTER NETWORKS

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks
Candidates should answer in their own words as far as practicable
All symbols are of usual significance.

Answer Question No. 1 and any *four* from the rest

1. Answer any ***four*** questions: 2×4 = 8

   (a) Mention the names of three widely used guided media in transmission mechanism.

   (b) What are the full form of PSK and PSM?

   (c) Differentiate between internal modem and external modem.

   (d) What are the full form of WNS, DNS and https?

   (e) Why Half Duplex Communication is used?

   (f) What is the purpose of a guard band?

   (g) What is the relevance of 'three way handshake' is used in Transport Layer function and protocol?

2. (a) What is Network Topology? 2+6

   (b) There are *N* devices, to be connected through a network. How many distinct cable links would be required if the following topology is followed?

   (i) Mesh, (ii) Ring, (iii) Bus.

3. (a) State and explain Nyquist Formula. 2+2+4

   (b) Determine the maximum (theoretical) limit of bit rate (in bits per second), in a noiseless channel, of a Bandwith of 5000 Hz transmitting 64 levels.

   (c) State and explain the Basic Service Set (BSS) for Wireless LAN as provided in IEEE 802.11 specification.

4. Compare and contrast in between the following error recovery protocols. 2+2+4

   (a) Stop and Wait ARQ (Automatic Repeat Request)

   (b) Go Back n ARQ

   (c) How many bytes of data can be sent in 15 seconds over a serial link with baud rate of 96000 in asynchronous mode with odd parity and two stop bits in the frame?

5. What is port address, logical address and physical address? A composite signal contains frequencies from 10 to 30 KHz, each with amplitude of 10V. Draw the Frequency spectrum. What does a decibel measure? 3+3+2

6. (a) Compare and contrast in between Amplitude Modulation and Frequency Modulation with appropriate example. 5+3

   (b) Why TCP is said to be reliable and connection oriented protocol?

7. (a) What is routing? 2+6

   (b) Compare and contrast in between *Non Adaptive Routing Algorithm* and *Adaptive Routing Algorithm*.

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

——×——