OBE

REFNO044664

B.Sc. (Hons.) SEMESTER V EXAMINATION 2021-22

COMPUTER SCIENCE

CS – 201 : Operating System Concepts

Time : 4.30 hours **Max. Marks : 70**

Instructions

1. **The Question Paper contains 08 questions out of which you are required to answer any 04 questions. The question paper is of 70 marks with each question carrying 17.5 marks.**

   प्रश्नपत्र में आठ प्रश्न पूँछे गये हैं जिनमें से 4 प्रश्नों का उत्तर देना है। प्रश्नपत्र 70 अंकों का है, जिसमें प्रत्येक प्रश्न 17.5 अंक का है।

2. The total duration of the examination will be **4.30 hours** (Four hours and thirty minutes), which includes the time for downloading the question paper from the Portal, writing the answers by hand and uploading the hand-written answer sheets on the portal.

   परीक्षा का कुल समय 4 घंटे का है जिसमें प्रश्नपत्र को पोर्टल से डाउनलोड करके पुनः हस्तलिखित प्रश्नों का उत्तर पोर्टल पर अपलोड करना है।

3. For the students with benchmark disability as per Persons with Disability Act, the total duration of examination shall be **6 hours** (six hours) to complete the examination process, which includes the time for downloading the question paper from the Portal, writing the answers by hand and uploading the hand-written answer sheets on the portal.

   दिब्यांग छात्रों के लिये परीक्षा का समय 6 घंटे निर्धारित हैं जिसमें प्रश्नपत्र को पोर्टल से डाउनलोड करना एवं हस्तलिखित उत्तर को पोर्टल पर अपलोड करना है।

4. Answers should be hand-written on a plain white A4 size paper using black or blue pen. Each question can be answered in upto 350 words on 3 (Three) plain A4 size paper (only one side is to be used).

   हस्तलिखित प्रश्नों का उत्तर सादे सफेद A4 साइज के पन्ने पर काले अथवा नीले कलम से लिखा होना चाहिये। प्रत्येक प्रश्न का उत्तर 350 शब्दों तक तीन सादे पृष्ठ A4 साइज में होना चाहिये। प्रश्नों के उत्तर के लिए केवल एक तरफ के पृष्ठ का ही उपयोग किया जाना चाहिए।

5. Answers to each question should start from a fresh page. All pages are required to be numbered. You should write your Course Name, Semester, Examination Roll Number, Paper Code, Paper title, Date and Time of Examination on the first sheet used for answers.

   प्रत्येक प्रश्न का उत्तर नये पृष्ठ से शुरू करना है। सभी पृष्ठों को पृष्ठांकित करना है। छात्र को प्रथम पृष्ठ पर प्रश्नपत्र का विषय, सेमेस्टर, परीक्षा अनुक्रमांक, प्रश्नपत्र कोड, प्रश्नपत्र का शीर्षक, दिनांक एवं समय लिखना है।

P.T.O.

Questions

1 (a) Identify the main characteristics of the program execution and development environment provided by serial processing, batch processing and Multiprogramming. **12.0**

(b) What are all the design goals of an operating System? Explain them in brief **5.5**

2 (a) Explain the three-level scheduling, which may coexist in a complex operating system. **7.5**

(b) What is starvation problem? Mention which scheduling algorithms suffer from this problem. **2.0**

(c) Let there are 3 processes in the system **8.0**

Process	Burst Time	Arrival Time	Priority
P_1	5	0	2
P_2	15	1	3
P_3	10	2	1

Draw Gantt chart and find Average waiting time and Average turnaround time for the following scheduling algorithms

(i) Shortest Job First (both pre-emptive and non pre-emptive)
(ii) Priority Queue (pre-emptive)
(iii) Round Robin (Quantum = 2ms)

3 (a) How is logical address translated to physical address in Paging? and Explain with a neat diagram **5.5**

(b) Consider a logical address space of 8 pages of 1024 words each, mapped onto a physical memory of 32 frames. How many bits are there in the physical address and logical address respectively?. **2.0**

(c) Consider a user program of logical address of size **6** pages and page size is **4** bytes. The physical address contains **256** frames. The user program consists of **22** instructions **a, b, c, . . . u, v** . Each instruction takes **1 byte**. Assume at that time the free frames are **7, 26, 52, 20, 55, 6, 18, 21, 70,** and **90. Find the following?** **10.0**

(i) Draw the logical and physical maps and page tables?
(ii) Allocate each page in the corresponding frame?
(iii) Find the physical addresses for the instructions **m, d, v, r**?
(iv) Calculate the fragmentation if exist

4 (a) Explain the different Directory Structures **7.0**

(b) What do you mean by memory fragmentation? Differentiate between internal and external memory fragmentation. **4.5**

(c) Given 5 memory partitions 100kb, 500kb, 200kb, 300kb, 600kb. How First fit, Best fit and worst fit algorithms processes 212kb, 417kb, 112kb and 426kb (in order)? Also calculate both internal and external fragmentation in each case. **6.0**

5 (a) What are the necessary conditions for a deadlock to occur? Explain the deadlock Prevention policies. How can a system recover from deadlock, if one is known to exist? **10.0**

(b) Let the number of processes = <P0, P1, P2, P3, P4> and three resource type X, Y, Z are there in a system where X=3, Y=3 and Z=2 are available. Consider the following scenario, where the column allocation denotes the number of units of each resource type allocated to each process, and the column request denotes the number of units of each resource type requested by a process in order to complete execution. Check whether the system is in safe state or not and show all steps involved in checking. **7.5**

	Allocation			Request		
	X	Y	Z	X	Y	Z
P0	0	1	0	7	5	3
P1	2	0	0	3	2	2
P2	3	0	2	0	0	2
P3	2	1	1	2	2	2
P4	0	0	2	4	3	3

6 (a) Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 53, and the previous request was at cylinder 50. The queue of pending requests, in FIFO order is **7.5**

98, 183, 37, 122, 14, 124, 65, 67.

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending request for each of the following disk scheduling algorithms

(i) FCFS
(ii) SSTF
(iii) SCAN

(b) What is file attribute? Also explain various file Allocation methods. **10.0**

7 (a) Describe Belady's anomaly and provide an example that illustrate anomalous behavior of FCFS **5.0**

(b) Let the page fault service time be 10ms in a computer with average memory access time being 20ns. If one page fault is generated for every 10^6 memory accesses, what is the effective access time for the memory? **1.5**

(c) Let us consider following reference string with 2 frames available initially. Reference string: 1, 1, 2, 2, 1, 4, 2, 3, 3, 5, 5, 4. Find the number of page fault occur in the following page replacement algorithm? Show all intermediate steps involved. (6 marks) **6.0**

(i) FIFO
(ii) Optimal
(iii) LRU

(d) Explain the Working Set theory for Page Replacement and Allocation **5**

8 Explain the following

(a) Segmentation **5.5**

(b) Context Switching and Threads **6.0**

(c) Critical Section and semaphores **6.0**

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