**ABES Engineering College, Ghaziabad**

# B. Tech (Second Year) Even Semester Sessional Test-1

**Printed Pages: 4**

**Session: 2022-2023**

**Course Code: KCS401 Roll No.:**

**Course Name: Operating System Date of Exam:**

**Maximum Marks: 75 Time: 2 Hrs**

**Instructions:**

1. **Attempt All sections.**
2. **If require any missing data, then choose suitably.**

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| **Q. No.** | **Question** | **Marks** | **CO** | **KL** | **PI** |
| **Section-A Total Marks : 5\*2 =10** | | | | | |
| **1** | **Attempt ALL Parts** |  | | | |
| **a)** | Define Operating system and mention its major functions. | **1+1** | **CO1** | K1 | 1.3.1 |
| **b)** | Explain the concept of Re-entrant Kernel in brief. | **2** | **CO1** | K2 | 1.3.1 |
| **c)** | What are the performance criteria in CPU scheduling. | **2** | **CO2** | K1 | 1.3.1 |
| **d)** | Describe the typical elements of Process Control block. | **2** | **CO2** | K2 | 1.3.1 |
| **e)** | Explain the key factors which are necessary for principle of concurrency. | **2** | **CO3** | K2 | 1.3.1 |
| **Section-B Total Marks : 3\*5 = 15** | | | | | |
| **2** | **Attempt ANY ONE part from the following** |  | | | |
| **a)** | Explain various states of a process with the help of a diagram. Explain, how many processes can be in a ready state considering uniprocessor system environment? | **3+2** | **CO1** | K2 | 1.3.1, 1.4.1 |
| **b)** | Explain the fork() system call with the help of suitable example . | **5** | **CO1** | K2 | 1.3.1, 1.4.1 |
| **3** | **Attempt ANY ONE part from the following** |  | | | |
| **a)** | Consider the following set of processes, assumed to have arrived at time 0. Consider the CPU scheduling algorithms Shortest Job First (SJF) and Round Robin (RR). For RR, assume that the processes are scheduled in the order P1, P2, P3, P4.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Processes | P1 | P2 | P3 | P4 | | Burst Time | 8 | 7 | 2 | 4 |   If the time quantum for RR is 4 ms, Then calculate the absolute value of the difference between the average turnaround times (in ms) of SJF and RR (round off to 2 decimal places).  **(GATE CS-2020)** | **5** | **CO2** | K3 | 1.4.1, 2.4.1 |
| **b)** | Consider the set of processes with arrival time (in milliseconds), CPU burst time (in milliseconds) and priority (0 is highest priority) shown below. None of the processes have I/O burst time.   |  |  |  |  | | --- | --- | --- | --- | | Process | Arrival Time | Burst Time | Priority | | P1 | 0 | 11 | 2 | | P2 | 5 | 28 | 0 | | P3 | 12 | 2 | 3 | | P4 | 2 | 10 | 1 | | P5 | 9 | 16 | 4 |   Calculate the average waiting time (in milliseconds) of all the processes using pre-emptive priority scheduling algorithm.  **(GATE CS-2017)** | **5** | **CO2** | K**3** | 1.4.1, 2.4.1 |
| **4** | **Attempt ANY ONE part from the following** |  | | | |
| **a)** | Consider the methods used by processes P1 and P2 for accessing their critical sections whenever needed, as given below. The initial values of shared Boolean variables S1 and S2 are randomly assigned  Method Used by P1  Method Used by P2  while (S1 != S2) ; while (S1 == S2) ;  Critica1 Section Critica1 Section  S1 = S2; S2 = not (S1);  Elaborate the following criteria's with respect to the above-mentioned problem   1. Mutual Exclusion 2. No Progress   **(GATE CS-2010)** | **2.5+2.5** | **CO3** | K3 | 1.4.1, 2.4.1 |
| **b)** | What is race condition. Consider the following two processes P1 and P2. Explain in detail whether the following code raise to race condition if shared variable is initialized as 5.   |  |  | | --- | --- | | P1 | P2 | | x=shared;  x++;  Sleep(1)  Shared=x; | y=shared;  y--;  Sleep(1)  Shared=y; |   **(GATE CS-2009)** | **1+4** | **CO3** | K3 | 1.4.1, 2.4.1 |
| **Section-C Total Marks : 5\*10 = 50** | | | | | |
| **5** | **Attempt ANY ONE part from the following** |  | | | |
| **a)** | Explain in detail about the multi-threaded operating system and also discuss its types. | **5 +5** | **CO1** | K2 | 1.3.1, 1.4.1 |
| **b)** | Explain the following concepts:   1. Time sharing operating system 2. Multi Programming operating system 3. System call | **3+3+4** | **CO1** | K2 | 1.3.1, 1.4.1 |
| **6** | **Attempt ANY ONE part from the following** |  | | | |
| **a)** | Explain the difference between   1. Hard Real time and Soft Real time System 2. Process and Threads 3. Distributed and Clustered operating system | **3+4+3** | **CO1** | K2 | 1.3.1, 1.4.1 |
| **b)** | Discuss monolithic kernel, layered and micro kernel structures of operating system. | **3+3+4** | **CO1** | K2 | 1.3.1, 1.4.1 |
| **7** | **Attempt ANY ONE part from the following** |  | | | |
| **a)** | Consider the resource allocation graph in the figure.  Inserting image...  i) Find if a system is in a deadlock state  ii) If not find a safe sequence. | **5+5** | **CO2** | K3 | 1.4.1, 2.4.1 |
| **b)** | A system has 3 processes, each requiring 2 units of resources R.   1. Find the minimum number of units of ‘R’ such that no deadlock will occur. 2. Find the maximum number of units of ‘R’ such that deadlock will occur.   Explain both the cases with detailed explanation. | **3.5+3.5+3** | **CO2** | K3 | 1.4.1, 2.4.1 |
| **8** | **Attempt ANY ONE part from the following** |  | | | |
| **a)** | Consider a system that contains 5 processes P1, P2, P3, P4, P5 and 3 resource types. A has 10 instances, B has 5 and C has 7 instances.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Process | Allocated | | | Max Need | | | Current Available | | | |  | A | B | C | A | B | C | A | B | C | | P1 | 0 | 1 | 0 | 7 | 5 | 3 | 3 | 3 | 2 | | P2 | 2 | 0 | 0 | 3 | 2 | 2 |  |  |  | | P3 | 3 | 0 | 2 | 9 | 0 | 2 |  |  |  | | P4 | 2 | 1 | 1 | 4 | 2 | 2 |  |  |  | | P5 | 0 | 0 | 2 | 5 | 3 | 3 |  |  |  |   Answer the following questions.   1. What is the reference of the need matrix 2. Determine if the system is safe or not. If yes, then write its safe sequence. 3. What will happen if the resource request (1,0,2) for process P1, can the system accept this request immediately. | **4+3+3** | **CO2** | K3 | 1.4.1, 2.4.1 |
| **b)** | Consider the following snapshot of a system.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Process | Allocated | | | | Max | | | | |  | A | B | C | D | A | B | C | D | | P0 | 3 | 0 | 1 | 4 | 5 | 1 | 1 | 7 | | P1 | 2 | 2 | 1 | 0 | 3 | 2 | 1 | 1 | | P2 | 3 | 1 | 2 | 1 | 3 | 3 | 2 | 1 | | P3 | 0 | 5 | 1 | 0 | 4 | 6 | 1 | 2 | | P4 | 4 | 2 | 1 | 2 | 6 | 3 | 2 | 5 |   Using the banker’s algorithm, determine whether or not each of the following states is unsafe. If it is safe, illustrate the order in which the processes may be completed. Otherwise, illustrate why the state is unsafe.   1. Available = (0,3,0,1) 2. Available = (1,0,0,2) | **5+5** | **CO2** | K3 | 1.4.1, 2.4.1 |
| **9** | **Attempt ANY ONE part from the following** |  | | | |
| **a)** | What is a critical section problem. Give the conditions that a solution to the critical section problem must satisfy. | **4+6** | **CO3** | K2 | 1.3.1, 1.4.1 |
| **b)** | What is producer- consumer problem. How it can illustrate the classical problem of synchronization. Explain | **4+6** | **CO3** | K2 | 1.3.1, 1.4.1 |

CO Course Outcomes mapped with respective question

KL Bloom's knowledge Level (K1, K2, K3, K4, K5, K6)

K1- Remember, K2- Understand, K3-Apply, K4- Analyze, K5: Evaluate, K6- Create