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**GIET UNIVERSITY, GUNUPUR – 765022**  
**B. C. A (Third Semester) Examinations, January' 2023**  
**BCA20301- Fundamentals of Operating systems**

Time: 3 hrs

Maximum: 70 Marks

**The figures in the right hand margin indicate marks.**

**PART – A: (Multiple Choice Questions)****(1 x 10 = 10 Marks)**Q. 1 Answer ALL questions

	CO #	PO #
a. Which of the following is not an operating system?	1	1
i. Windows		
ii. Linux		
iii. Oracle		
iv. DOS		
b. Which of the following is system software?	1	1
i. Operating system		
ii. Compiler		
iii. Utilities		
iv. All of the above		
c. Which conditions must be satisfied to solve a critical section problem?		
i. Bounded Waiting	3	1
ii. Progress		
iii. Mutual Exclusion		
iv. All of these.		
d. Which of the following "semaphore" can take the non-negative integer values?	3	1
i. Binary Semaphore		
ii. Counting Semaphore		
iii. Real Semaphore		
iv. All of the these		
e. The operating system work between	1	1
i. User and Computer		
ii. Network and User		
iii. One user to another user		
iv. All of the these		
f. Which of the following are CPU scheduling algorithms?	2	1
i. Priority scheduling		
ii. Round Robin		
iii. Shortest Job First		
iv. All of the above		
g. FIFO scheduling is a type of:	2	1
i. Pre-emptive scheduling		
ii. Non-pre-emptive scheduling.		
iii. Deadline scheduling		
iv. None of the above		
h. Which of the type of OS reads and reacts in terms of actual time?	1	2
i. Quick sharing OS		
ii. Time Sharing OS		
iii. Real time OS		
iv. Batch OS		
i. Thread is a	2	1
i. Light weight process		
ii. Heavy weight process		
iii. Multi-process		
iv. I/O process		
j. Among the following CPU scheduling algorithms, which of these allocated the CPU first to the process that requests the CPU first?	2	2
i. FCFS		
ii. SJF		
iii. Priority scheduling		
iv. None		

**PART – B: (Short Answer Questions)****(2 x 10 = 20 Marks)**Q.2. Answer ALL questions

	CO #	PO #
a. List out any two functions of operating system.	1	1
b. List the advantages of Real-Time operating system.	1	1
c. Explain kernel.	1	2
d. Explain semaphores and write its types.	2	1
e. What do you mean by system class.	2	1
f. List the different contents of Process control block.	2	1

- g. Write the output of the following code. 3      1
- ```
int main() {
    if(fork() == 0)
        if(fork())
            printf("Hello world!!\n");
    exit(0);
}
```
- h. Write the technologies used in inter-process communication. 3      1
- i. List the difference between user level and kernel level thread. 4      2
- j. What is use of fork command. 3      2

**PART – C: (Long Answer Questions)**

**(10 x 4 = 40 Marks)**

Answer ALL questions

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Marks        | CO #         | PO #       |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|------------|----------|----|---|---|---|----|---|---|---|----|---|---|---|----|---|---|---|----|---|---|---|--|--|--|
| 3.a. Define operating system List the various types of operating system. Explain different types of views of operating system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10           | 1            | 2          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| <b>(OR)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |              |            |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| b. List the different types of components of operating system and the services provided by them.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 10           | 1            | 2          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| 4.a. Write in detail with neat diagram of process state and explain detail about Process control block with neat diagram.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10           | 2            | 2          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| <b>(OR)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |              |            |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| b. What is a semaphore? List the types of semaphores and Show that, if the wait() and signal() semaphore operations are not executed atomically, then mutual exclusion may be violated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 10           | 3            | 2          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| 5.a. Assume the following workload in a system:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 10           | 2            | 2          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Process</th> <th style="width: 25%;">Arrival Time</th> <th style="width: 25%;">Burst Time</th> <th style="width: 35%;">Priority</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td style="text-align: center;">4</td> <td style="text-align: center;">6</td> <td style="text-align: center;">2</td> </tr> <tr> <td>P2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">7</td> <td style="text-align: center;">3</td> </tr> <tr> <td>P3</td> <td style="text-align: center;">1</td> <td style="text-align: center;">9</td> <td style="text-align: center;">1</td> </tr> <tr> <td>P4</td> <td style="text-align: center;">2</td> <td style="text-align: center;">2</td> <td style="text-align: center;">6</td> </tr> <tr> <td>P5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">3</td> <td style="text-align: center;">5</td> </tr> </tbody> </table> | Process      | Arrival Time | Burst Time | Priority | P1 | 4 | 6 | 2 | P2 | 3 | 7 | 3 | P3 | 1 | 9 | 1 | P4 | 2 | 2 | 6 | P5 | 6 | 3 | 5 |  |  |  |
| Process                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Arrival Time | Burst Time   | Priority   |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| P1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 4            | 6            | 2          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| P2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 3            | 7            | 3          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| P3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1            | 9            | 1          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| P4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2            | 2            | 6          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| P5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6            | 3            | 5          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| i. Draw a Gantt chart illustrating the execution of these jobs using FCFS, SJF, SRTF, Preemptive Priority and Round robin scheduling algorithm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |              |              |            |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| ii. Calculate the average waiting time and average turnaround time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |              |            |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| <b>iii.</b> State tie which is best for scheduling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |              |            |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| <b>(OR)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |              |            |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| b. Write short notes on:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 10           | 3            | 1          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| i. Different types scheduling queues                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |              |              |            |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| ii. Race condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |              |            |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| 6.a. Define deadlock. Explain “Why the resource-allocation graph is unable to characterize deadlock” with suitable example.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 10           | 4            | 2          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| <b>(OR)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |              |            |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |
| b. Define race condition. Explain with suitable example to explain the use of semaphore in dining-philosopher problem as classical problem of synchronization.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10           | 4            | 1          |          |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |    |   |   |   |  |  |  |

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