

**BACHELOR OF SCIENCE GENERAL DEGREE LEVEL II (SEMESTER I)
EXAMINATION – JULY/AUGUST 2016**

SUBJECT : COMPUTER SCIENCE
COURSE UNIT : COM2132/COM213β - Operating Systems

Time: 1 hour

Answer two (2) questions only.

1.

- a. A computer process goes through a series of discrete process states as it executes. Name and briefly explain five (05) different states of a process. (10 marks)
- b. Name the four (04) registers associated with an I/O port. (20 marks)
- c. State two (02) benefits of multi-threaded programming. (10 marks)
- d. State four (04) necessary conditions that are required to be satisfied simultaneously to cause a deadlock. (16 marks)
- e. Explain how to prevent circular wait condition in deadlock prevention. (04 marks)
- f. Consider the following system with five (05) processes: P_0, P_1, P_2, P_3 and P_4 . Its four (04) resource types: A, B, C and D are composed of 1, 5, 2 and 0 available resources respectively.

	Allocated				Maximum				Need			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	0	0	1	2	0	0	1	2				
P_1	1	0	0	0	1	7	5	0				
P_2	1	3	5	4	2	3	5	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

Table 1

Use Banker's Algorithm to answer the following questions.

- i. Write the contents of Need column in Table 1.
- ii. Is the system in a safe state? Briefly explain.
- iii. If a request from process P_1 arrives for (0,4,2,0) resources, can the request be granted immediately? Explain your answer.

(40 marks)

2.

- a. Briefly explain following terms associated with scheduling.
- i. Throughput
 - ii. Turnaround time (20 marks)
- b. Explain the problem of starvation that could be occurred during priority scheduling and give a possible solution for that problem. (20 marks)
- c. State the main functionality of CPU scheduler (short-term scheduler) (20 marks)
- d. A set of processes, their arrival times and burst times are given in Table 02. Use the table in answering the questions.

Process	Arrival Time (ms)	Burst Time(ms)
P ₁	0	16
P ₂	2	10
P ₃	5	4
P ₄	7	6
P ₅	8	11

Table 2

- i. Draw a Gantt chart to depict the scheduling under First-Come First-Served scheduling algorithm.
- ii. Calculate the average waiting time of the processes under First-Come First-Served scheduling.
- iii. Assume the quantum is set to 5ms. Draw a Gantt chart to depict the scheduling under Round-Robin scheduling.
- iv. Calculate the average waiting time of the processes under Round-Robin scheduling. (40 marks)

3.

- a. Memory protection is provided by using two registers. Name these two (02) registers and briefly mention the contents of them. (10 marks)
- b. Explain the difference between external and internal fragmentation in memory management with an example. (20 marks)
- c. Consider a paging system with 4096 logical address space and 64 pages and 64 frames.
- i. How many bits exist in the logical address?
 - ii. How many bits exist in the physical address?
 - iii. What is the size of the physical address space?
 - iv. How many bits are needed to signify the page number?

(20 marks)

- d. State two (02) problems in linked file allocation in an operating system. (20 marks)
- e. Consider a system that supports the strategies of contiguous, linked and indexed file allocation. What criteria should be used in deciding which strategy is best utilized for a particular file? (20 marks)
- f. General graph directory structure is one type of directory structures in operating systems. In some cases it may cause cycles in the graph. Discuss two ways of guaranteeing no cycles in this directory structure. (10 marks)
