Operating Systems Test 3

Number of Questions: 25 **Section Marks: 30**

Directions for questions 1 to 25: Select the correct alternative from the given choices.

1. Round Robin scheduling with large time slice behaves as:
   (A) FCFS
   (B) Priority based scheduling
   (C) Multi-level queue scheduling
   (D) Preemptive SJF

2. Priority inversion means:
   (A) Shortest Job waits for longest job
   (B) High priority process waits for low priority process
   (C) Longest job waits for shortest job
   (D) both (A) and (C).

3. Consider the following table with 4 processes:

Process	Arrived Time	Burst Time
P1	0	5
P2	1	4
P3	2	2
P4	3	3

   If Longest Remaining Time scheduling (Preemptive longest Job First) is used, then the average turnaround time is ______.
   (A) 11 (B) 12
   (C) 13 (D) 14

4. Consider the following table:

Process	Arrival Time	Burst Time
P0	0	4
P1	1	3
P2	1	3
P3	2	5

   If Longest Job First scheduling is used then the average waiting time is ______.
   (A) 5.00 (B) 5.25
   (C) 5.50 (D) 5.75

5. Consider the following table:

Process	Arrival Time	Turn around Time
P0	0	15
P1	0	2
P2	0	18
P3	0	20
P4	0	7

   If priority scheduling is used for scheduling, what is the burst time of process P_o?
   (A) 15 (B) 13
   (C) 8 (D) 3

6. As the time quantum increases for Round Robin scheduling, generally the average waiting time:
   (A) Increases
   (B) Decreases
   (C) Unchanged
   (D) Cannot be determined

7. Consider three processes $P0$, $P1$, $P2$ arrived at Time 0, with the burst times x, y, z respectively. $x < z < y$. What is the average waiting, if SJF is used for scheduling?
   (A) $\frac{x+y+z}{2}$ (B) $\frac{x+z}{3}$
   (C) $\frac{2x+z}{3}$ (D) $\frac{x+z+y}{3}$

8. Consider the following table:

Process	Arrival Time	Burst Time
P0	0	8
P1	1	4
P2	2	2

   What is average waiting time of processes which have taken more than one slot for completion, When SRTF is used for scheduling?
   (A) 2.66 (B) 3.0
   (C) 4.0 (D) 3.33

9. Match the following:

List 1		List 2	
(a)	Ready → Running	1.	Dispatching
(b)	Running → Waiting	2.	Preemption
(c)	Waiting → Ready	3	Completion
(d)	Running → Terminate	4.	I/O Request
(e)	Running → Ready	5	Event occurred

	a	b	c	d	e
(A)	1	2	3	4	5
(B)	1	4	5	3	2
(C)	1	4	2	3	5
(D)	1	2	5	4	3

10. Consider the following:

Process	Arrival Time	Burst Time
A	0	4
B	1	6
C	5	3
D	7	2

   What is the waiting time of process D, if FIFO scheduling is used?

(A) 3 (B) 2
(C) 6 (D) 12

11. Preemptive scheduling takes place when ______.
(I) process switches from Running to Ready
(II) process switches from Waiting to Ready
(III) process switches from Running to waiting
(IV) process terminates
(A) I, II (B) I, II, IV
(C) I, II, III (D) I, II, III and IV

12. Blocking and Non-blocking message passing is also known as:
(A) Synchronous and Asynchronous
(B) Direct and Indirect
(C) Limited Buffer and Zero buffer
(D) Pipes and FIFO

13. Number of child processes created for the following code segment is ______.
```
fork();
fork();
fork();
fork();
```
(A) 4 (B) 8
(C) 15 (D) 16

14. Which of the following statements are TRUE about threads?
I. Thread library provides support to both user and kernel level threads.
II. Threads improves the Responsiveness and Resource sharing.
III. Kernel level thread switching is faster than user level switching.
IV. User level thread maintenance is faster than kernel level threads.
(A) I and III (B) II and IV
(C) II and III (D) I, II and III

15. Match the following:

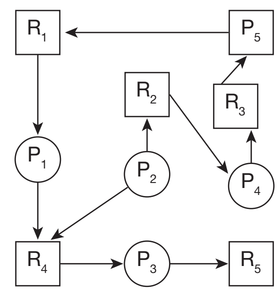
List 1		List 2	
P.	Starvation	1.	FCFS
Q.	Ageing	2.	Round Robin
R.	Context switching overhead	3.	Preemptive Priority
S.	Batch processing	4.	Highest Response Ratio next

	P	Q	R	S
(A)	1	4	2	3
(B)	4	1	3	2
(C)	3	4	2	1
(D)	1	4	3	2

16. Consider a system with four processes *A*, *B*, *C* and *D* and '*m*' instances of resource '*r*'. The resource requirements are 5, 7, 3 and 4 instances of resource '*r*' respectively. What is the minimum value of '*m*', hence system is dead lock free?
(A) 7 (B) 16
(C) 19 (D) 15

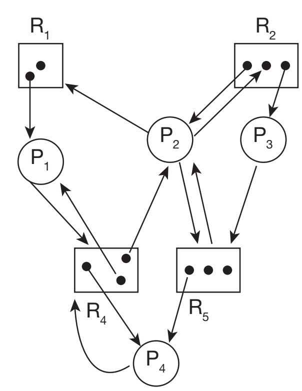
17. Which of the following system state may lead to deadlock? Let the system contains '*r*' instances of resources with '*n*' processes.
(Resource requests of each process represented in sets)
(A) $n = 5, r = 20, \{5, 5, 5, 5, 5\}$
(B) $n = 5, r = 20, \{5, 5, 4, 5, 5\}$
(C) $n = 6, r = 26, \{6, 6, 4, 3, 3, 2\}$
(D) $n = 6, r = 26, \{6, 6, 4, 3, 3, 3\}$

18. Consider the following Resource allocation Graph:



Which of the following cycle exist in it's equivalent wait-for-Graph?
(A) $P1 \rightarrow P2 \rightarrow P3 \rightarrow P4 \rightarrow P5 \rightarrow P1$
(B) $P1 \rightarrow P2 \rightarrow P3 \rightarrow P5 \rightarrow P1$
(C) $P1 \rightarrow P3 \rightarrow P4 \rightarrow P5 \rightarrow P1$
(D) $P2 \rightarrow P3 \rightarrow P4 \rightarrow P5 \rightarrow P1 \rightarrow P2$

19. Consider the following Resource allocation graph:



Which of the following dead lock cycle occurs in the given graph?
(A) $P_2 \rightarrow P_3 \rightarrow P_2$ (B) $P_2 \rightarrow P_1 \rightarrow P_4 \rightarrow P_2$
(C) Both (A) and (B) (D) None of the above

20. A counting semaphore has a value—a at a certain time, it represents:
(A) '*a*' number of processes waiting
(B) '*a*' number of process in critical section
(C) Either (A) or (B)
(D) None, negative values are not allowed on Counting semaphore

21. Semaphores ______.
(A) are process synchronization tools to avoid deadlock.

(B) are process synchronization tools to avoid race condition.
(C) uses Test And Set for synchronization.
(D) All the above

22. The system is running with 5 processes. Consider the following code segments for synchronization:

```
process 1:
while(1)
{
signal (mutex);
<Critical Section; >
signal (mutex);
}
Process i where i = 2,3,4,5.
while (1)
{
wait (mutex);
< Critical Section >
signal (mutex);
}
```

'mutex' is a binary semaphore.
Atmost how many processes can enter into the critical section?

(A) 1 (B) 2
(C) 3 (D) 5

23. Let $P0$ and $P1$ are two processes, each accesses two binary semaphores $s1$ and $s2$ to enter critical section. $s1$ and $s2$ are initialized to 1.

P_0:	P_1:
X;	W;
<critical section>	<critical section>
Y;	Z;

Consider the following code segments:

I.	wait ($s1$);	wait ($s2$);
II.	wait ($s2$);	wait ($s1$);
III.	signal ($s1$);	signal ($s2$);
IV.	signal ($s2$);	signal ($s1$);

Which of the following may lead to deadlock?

	X	Y	W	Z
(A)	I	III	II	IV
(B)	I	III	I	III
(C)	II	IV	II	IV
(D)	I	III	I	IV

24. Consider the following snapshot of a system:

	Max			Allocation		
Process	R_1	R_2	R_3	R_1	R_2	R_3
a	3	2	4	1	1	1
b	5	5	2	2	3	2
c	4	4	3	3	1	1
d	3	4	4	1	0	1

Available = {5, 3, 2}
Which of the following is not a safe sequence?

(A) *a b c d* (B) *b c d a*
(C) *b a c d* (D) *c a d b*

25. In the above system, if process '*A*' requests for {0, 1, 2} resources and if the request is granted, then the system state is ______.

(A) safe state
(B) unsafe state
(C) deadlock
(D) either (B) or (C)

Answer Keys

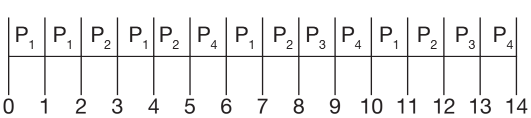
1. A	**2.** B	**3.** A	**4.** B	**5.** C	**6.** A	**7.** C	**8.** C	**9.** B	**10.** C
11. D	**12.** A	**13.** C	**14.** B	**15.** C	**16.** B	**17.** A	**18.** C	**19.** D	**20.** A
21. B	**22.** D	**23.** A	**24.** A	**25.** A					

Hints and Explanations

1. Choice (A)

2. Choice (B)

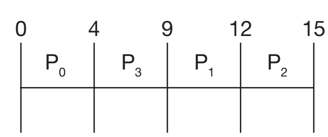
3.



Process	AT	CT	TAT
P_1	0	11	11
P_2	1	12	11
P_3	2	13	11
P_4	3	14	11

$$\text{Average TAT} = \frac{11+11+11+11}{4} = 11$$ Choice (A)

4.

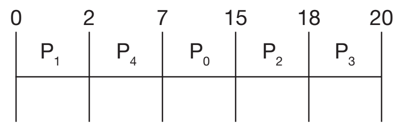


Process	AT	BT	CT	TAT	WT
P_0	0	4	4	4	0
P_1	1	3	12	11	8
P_2	1	3	15	14	11
P_3	2	5	9	7	2

Average $WT = \frac{(0+8+11+2)}{4} = \frac{21}{4} = 5.25$

Choice (B)

5. Gantt Chart:



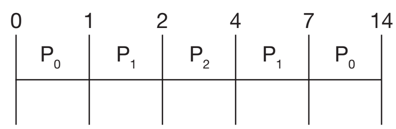
Waiting Time of P_0 is 7.

$BT = TAT - WT = 15 - 7 = 8$ Choice (C)

6. Choice (A)

7. Choice (C)

8.



Process	AT	TAT	WT
P_0	0	14	6
P_1	1	6	2
P_2	2	2	0

Processes P_0 and P_1 executed in multiple slots.

Hence average waiting time of (P_0 and P_1) $= \frac{6+2}{2} = 4$

Choice (C)

9. Choice (B)

10. Processes '*D*' schedules at time 13.

Waiting Time = 13 – 7 (AT) = 6 Choice (C)

11. Choice (D)

12. Choice (A)

13. Choice (C)

14. Choice (B)

15. Choice (C)

16. **Method 1:**

Each process requirement is S_i for process 'i'.

i	–	A	B	C	D
S_i	–	5	7	3	4

Assume for each process i, $(S_i - 1)$ resources are allocated.

A	B	C	D	
4	6	2	3	allocated

This system state result in deadlock i.e., the system with ≤15 resources may lead to deadlock.

If atleast one extra resource available in this state, the system becomes deadlock free.

∴ 16 resources required.

Method 2:

$$\sum_{i=1}^{n} S_i < (m + n)$$

S_i – resources required for process 'i'.

m – number of resources in system

n – number of process in system.

$(5 + 7 + 3 + 4) < m + 4 \Rightarrow m = 16$ Choice (B)

17. Use this formula to check deadlock state.

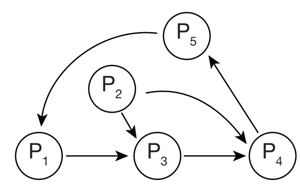
$$\sum_{i=1}^{n} S_i < (m + n)$$

S_i – Resources required for process 'i'.

m – Number of resources

n – Number of process Choice (A)

18. The wait-for-graph for given resource allocation graph is shown below:



Choice (C)

19. No dead lock exists in given graph. Choice (D)

20. Choice (A)

21. Choice (B)

22. Assume that process 2 entered critical section that results in wait of process 3, 4 and 5. But process 1 can enter. Then one more process can enter C.S. If process 1 leaves C.S., then again one more process can enter C.S. Similarly if process 1 enters and exits the C.S. again, 2 more processes can enter C.S. Choice (D)

23. Semaphores may be signalled in any order. But semaphores must be locked in same order. Choice (A)

24. Need of process '*A*' is {2, 1, 3}, which is greater than available. Choice (A)

25. Process '*B*' can execute in resultant state, which leads to completion of *A*, *C* and *D*. Choice (A)