



**FEDERAL PUBLIC SERVICE COMMISSION**  
**COMPETITIVE EXAMINATION-2022 FOR RECRUITMENT TO**  
**POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT**

<u>Roll Number</u>
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**COMPUTER SCIENCE, PAPER-II**

<b>TIME ALLOWED: THREE HOURS</b>	<b>PART-I (MCQS)</b>	<b>MAXIMUM MARKS = 20</b>
<b>PART-I(MCQS): MAXIMUM 30 MINUTES</b>	<b>PART-II</b>	<b>MAXIMUM MARKS = 80</b>
<b>NOTE: (i) Part-II is to be attempted on the separate Answer Book.</b> <b>(ii) Attempt ONLY FOUR questions from PART-II by selecting TWO questions from EACH SECTION. ALL questions carry EQUAL marks.</b> <b>(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.</b> <b>(iv) Candidate must write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.</b> <b>(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.</b> <b>(vi) Extra attempt of any question or any part of the attempted question will not be considered.</b>		

**PART – II (SECTION – A)**

- Q. 2. (a)** The following processes are being scheduled using a preemptive, round robin scheduling algorithm. Each process is assigned a numerical priority, with a higher number indicating a higher relative priority. In addition to the processes listed below, the system also has an *idle* task (which consumes no CPU resources and is identified as  $P_{idle}$ ). This task has priority 0 and is scheduled whenever the system has no other available processes to run. The length of a time quantum is 10 units. If a process is preempted by a higher-priority process, the preempted process is placed at the end of the queue. **(10)**

<i>Process</i>	<i>Priority</i>	<i>Burst</i>	<i>Arrival</i>
P1	40	20	0
P2	30	25	25
P3	30	25	30
P4	35	15	60
P5	5	10	100
P6	10	10	105

Show the scheduling order of the processes using a Gantt chart. What is the turnaround time and waiting time for each process?

- (b)** Suppose the disk head is initially located at track 20, set to move in order of increasing tracks. Assume a disk with 100 tracks and that the disk request queue has random requests in it. The requested tracks, in the order received by the disk scheduler, are **(6)**
- 18, 25, 73, 46, 9, 92

Using C-SCAN algorithm, find the performance in terms of average seek time.

- (c)** What design and management issues are raised by the existence of concurrency? **(4)**

- Q. 3. (a)** Consider the following snapshot of the system. **(12)**

<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>R1</th> <th>R2</th> <th>R3</th> <th>R4</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>5</td> <td>1</td> <td>1</td> <td>7</td> </tr> <tr> <td>P2</td> <td>3</td> <td>2</td> <td>1</td> <td>1</td> </tr> <tr> <td>P3</td> <td>3</td> <td>2</td> <td>2</td> <td>1</td> </tr> <tr> <td>P4</td> <td>4</td> <td>6</td> <td>1</td> <td>3</td> </tr> <tr> <td>P5</td> <td>6</td> <td>3</td> <td>2</td> <td>3</td> </tr> </tbody> </table> <p>Claim Matrix C</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>R1</th> <th>R2</th> <th>R3</th> <th>R4</th> </tr> </thead> <tbody> <tr> <td>12</td> <td>13</td> <td>6</td> <td>8</td> </tr> </tbody> </table> <p>Resource Vector</p>		R1	R2	R3	R4	P1	5	1	1	7	P2	3	2	1	1	P3	3	2	2	1	P4	4	6	1	3	P5	6	3	2	3	R1	R2	R3	R4	12	13	6	8	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>R1</th> <th>R2</th> <th>R3</th> <th>R4</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>4</td> <td>0</td> <td>1</td> <td>4</td> </tr> <tr> <td>P2</td> <td>2</td> <td>2</td> <td>1</td> <td>0</td> </tr> <tr> <td>P3</td> <td>2</td> <td>1</td> <td>2</td> <td>1</td> </tr> <tr> <td>P4</td> <td>0</td> <td>5</td> <td>1</td> <td>0</td> </tr> <tr> <td>P5</td> <td>4</td> <td>2</td> <td>1</td> <td>2</td> </tr> </tbody> </table> <p>Allocation Matrix A</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>R1</th> <th>R2</th> <th>R3</th> <th>R4</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>3</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>Available Vector</p>		R1	R2	R3	R4	P1	4	0	1	4	P2	2	2	1	0	P3	2	1	2	1	P4	0	5	1	0	P5	4	2	1	2	R1	R2	R3	R4	0	3	0	1
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Using banker's algorithm, determine whether the state is safe or unsafe. If the state is safe, illustrate the order in which the processes may complete. Otherwise, illustrate why the state is unsafe.

- (b)** Give an account of different functions of Logical File System. **(4)**

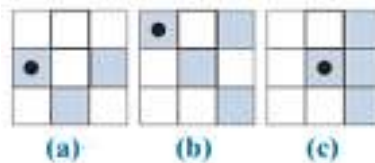
- (c)** What resources are used when a thread is created? How do they differ from those used when a process is created? **(4)**

**COMPUTER SCIENCE, PAPER-II**

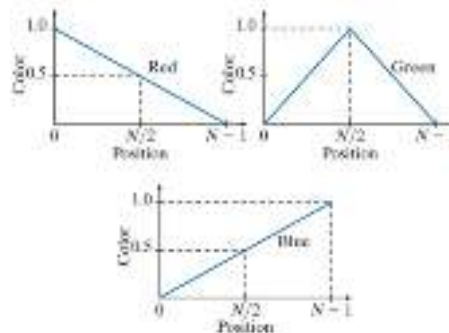
- Q.4.** (a) Assume a pipeline with four stages: fetch instruction (FI), decode instruction and calculate addresses (DA), fetch operand (FO), and execute (EX). Draw a diagram for a sequence of 7 instructions, in which the third instruction is a branch that is taken and in which there are no data dependencies. (8)
- (b) A set associative cache consists of 64 lines, or slots, divided into 4-slot sets. Main memory contains 4K blocks of 128 words each. Show the format of main memory addresses. (6)
- (c) Why is DMA access to main memory given higher priority than CPU access to main memory? (6)
- Q.5.** (a) Describe any one of the routing algorithms in detail, which is used to resolve the conflict between path selections. (8)
- (b) A company occupies four buildings on a campus. Each of these building has a 100 base T network running to all the floors. The buildings form a square 100 meter on each side. The network must support 100 Mbps data transfer rate. What will be the proposed design solution under the given condition? (6)
- (c) What is the main fault in TCP 3-way handshake which makes it a boon for attackers? Many operating systems generally associate a “Backlog” parameter with a listening socket that sets cap on the number of TCBs simultaneously in SYN-RECEIVED state. Does this parameter solve the problem in TCP 3-way handshake? (6)

**SECTION – B**

- Q.6.** (a) Find the reflection,  $\hat{B}$ , of each of the following Structuring Elements (SE). The dot indicates the origin of the SE. (8)



- (b) The R, G, and B component images of an RGB image have the horizontal intensity profiles shown in the following diagram. Show your working to identify color that a person would see in the middle column of this image (8)



- (c) How Digital Image Processing and Computer Vision are related? Discuss. (4)

- Q.7.** (a) Explain 3-tier web application architecture. (8)
- (b) Write the jQuery code to slide elements up and down. Also write the code to fade the elements in and out of visibility. Use HTML, CSS, and jQuery. (6)
- (c) What is web application promotion? Discuss some of the common webvertising methods. (6)

- Q.8.** (a) Explain process of Web Application Testing. (8)
- (b) Explain in detail the Document Object Model (DOM). Also discuss XML and RSS. (6)
- (c) Explain how can you access a database from a JSP page? Give the database connectivity issues in details. (6)

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