

INTERRUPT — SOLUTION KEY

Total Points: 70 | Questions: 7 | Date: February 20, 2026

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AI-generated graduate-level computer_{eng} assignment. Contains 7 questions covering key concepts. Includes content from 1 document(s).

Question 1

10.0 points

Explain the concept of an interrupt in a computer system and its significance in real-time processing.

ANSWER

An interrupt is a signal to the processor emitted by hardware or software indicating an event that needs immediate attention. It interrupts the current code execution to process the interrupt event, allowing for real-time processing and efficient handling of time-sensitive tasks.

GRADING RUBRIC

Points for providing a clear explanation of interrupts, their role in preempting ongoing processes, and their importance in real-time systems.

Question 2

10.0 points

Calculate the time taken to process a single interrupt given a clock cycle time of 2 ns and an interrupt handler that takes 50 cycles to execute.

ANSWER

The time taken is $2 \text{ ns} \times 50 \text{ cycles} = 100 \text{ ns}$.

GRADING RUBRIC

Award points for correct calculation of interrupt processing time. Partial credit for correct setup of the equation.

Question 3

10.0 points

Analyze the diagram below showing an interrupt handler workflow where an interrupt request is received, prioritized, and processed. Describe how the priority mechanism facilitates task handling.

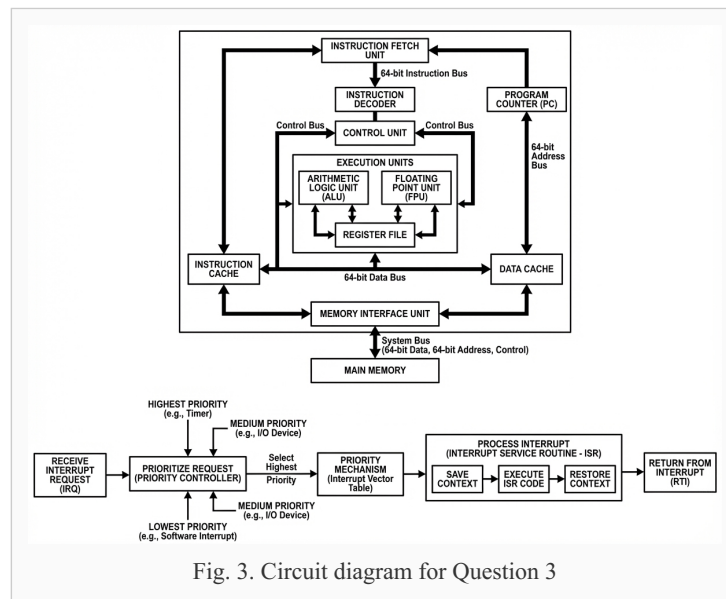


Fig. 3. Circuit diagram for Question 3

ANSWER

The priority mechanism ensures that higher-priority tasks are processed before lower-priority tasks, improving system responsiveness. The diagram shows how requests are queued and prioritized, ensuring critical tasks are executed promptly.

GRADING RUBRIC

Award points for identifying priority and its role in task optimization. Consider clarity and completeness of explanation.

Question 4

10.0 points

Differentiate between hardware and software interrupts with examples for each.

ANSWER

Hardware interrupts are signals from hardware devices (e.g., a keyboard interrupt when a key is pressed). Software interrupts are generated by programs, often called exceptions (e.g., division by zero error).

GRADING RUBRIC

Award points for clear definitions and relevant examples. Distinction between hardware and software interrupts must be included.

Question 5

10.0 points

Determine the priority of an interrupt given a priority encoded value of 110 and a 3-bit priority encoder, with the highest priority being 111.

ANSWER

The priority of the interrupt with encoded value *110* is lower than the highest priority (*111*). It represents the second highest priority level.

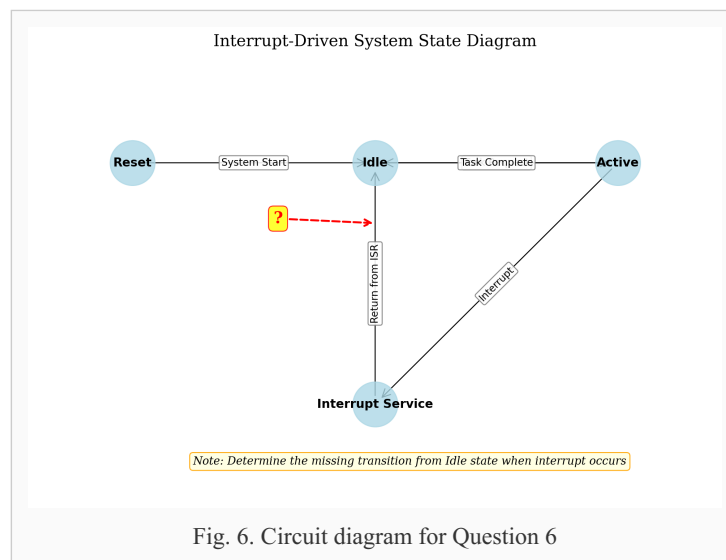
GRADING RUBRIC

Points for correct interpretation of priority levels using binary encoded values.

Question 6

10.0 points

In the diagram below, describe the transitions that occur when an interrupt happens while the system is in the "Idle" state.

**ANSWER**

Upon receiving an interrupt in the "Idle" state, the system transitions to the "Processing Interrupt" state, processes the interrupt, and returns to the "Idle" state upon completion if no other interrupts are pending.

GRADING RUBRIC

Award full points for accurately describing the transitions. Partial credit for partial descriptions or missing states.

Question 7

10.0 points

Describe how a nested interrupt works in a system and provide an example of its application using the diagram below.

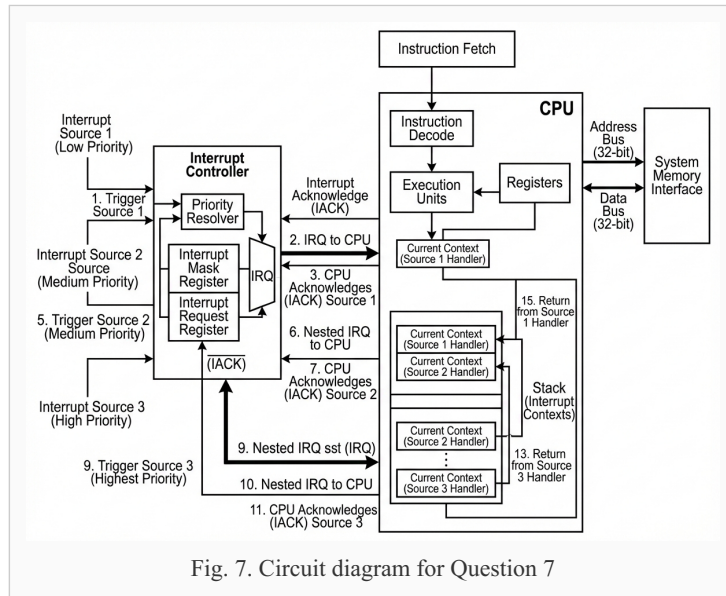


Fig. 7. Circuit diagram for Question 7

ANSWER

Nested interrupts allow a higher-priority interrupt to preempt a lower-priority one during its execution. For example, in a medical monitoring system, a critical alarm can interrupt less critical data logging to alert medical staff immediately.

GRADING RUBRIC

Award points for understanding of nested interrupts and correct application example. Consider depth and clarity of explanation.