



**POSTAL
BOOK PACKAGE**

2025

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**MECHANICAL
ENGINEERING**

Objective Practice Sets

Robotics and Mechatronics

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Microprocessor, Microcontroller, PLC

- Q.1** Consider the following statements comparing static RAM with dynamic RAM:
1. In static RAM typical cell requires more number of transistors than dynamic RAM.
 2. Power consumption per bit of static RAM is less than that of dynamic RAM.
- Which statements is/are correct?
- (a) 1 and 2 only (b) 1 only
(c) 2 only (d) None of these
- Q.2** In microprocessor, the register which holds address of the next instruction to be fetched is
- (a) accumulator (b) program counter
(c) stack pointer (d) instruction register
- Q.3** Which of the following statements are correct?
1. DRAM offers reduced power consumption.
 2. An associative memory is cheaper than RAM.
- (a) 1 only (b) 2 only
(c) Both 1 and 2 (d) None of these
- Q.4** The program counter (PC) in a microprocessor
- (a) counts the number of program being executed by the microprocessor.
(b) counts the number of instruction being executed by the microprocessor.
(c) count the number of interrupts handled by the microprocessor.
(d) keeps the address of the next instruction to be fetched.
- Q.5** A memory system has a total of 8 memory chips each with 12 address lines and 4 data lines. The size of memory system is
- (a) 16 kB (b) 32 kB
(c) 48 kB (d) 64 kB
- Q.6** Which statements is/are correct?
1. A processor can reference a memory stack without specifying an address.
 2. The address is always available and automatically updated in the stack pointer.
- (a) 1 only
(b) 2 only
(c) Both 1 and 2 and 2 explains 1
(d) Both 1 and 2 but 2 does not explain 1
- Q.7** In 8085 microprocessor, the value of the most significant bit of the result following the execution of any arithmetic or Boolean instruction is stored in the
- (a) Carry status flag
(b) Auxiliary carry status flag
(c) Sign status flag
(d) Zero status flag
- Q.8** The address bus of Intel 8085 is 16 bit and hence the memory which can be accessed by this address bus is
- (a) 1 kB (b) 16 kB
(c) 32 kB (d) 64 kB
- Q.9** A microprocessor based system can perform many different function because
- (a) Its operation is controlled by software
(b) It is digital system
(c) It uses a RAM
(d) It can be controlled by input and output device
- Q.10** Which of the following are included in architecture of a computer?
1. Addressing mode, CPU
 2. Instruction mode, data formats
 3. Secondary memory, operating system.
- Select the correct answer using the codes below:
- (a) 1 and 2 (b) 3 and 1
(c) 2 and 3 (d) 3 only
- Q.11** Which of the following is/are correct statements?
1. Bus is a group of wires carrying information.
 2. Bus is needed to achieve reasonable speed of operation.
 3. Bus can carry data or address.
 4. A bus can be shared by more than one device.

Direction (Q.51 to Q.53): The following questions consist of two statements, one labelled as 'Statement (I)' and the other labelled as 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the codes given below.

Codes:

- Both Statement (I) and Statement (II) are true and Statement (II) is the correct explanation of Statement (I).
- Both Statement (I) and Statement (II) are true but Statement (II) is not a correct explanation of Statement (I).
- Statement (I) is true but Statement (II) is false.
- Statement (I) is false but Statement (II) is true.

Q.51 Statement (I): The data bus and address bus of 8085 microprocessor are multiplexed.

Statement (II): Multiplexing reduces the number of pins.

Q.52 Statement (I): The function of arithmetic logic unit (ALU) in microprocessor is to perform data manipulation.

Statement (II): The status register is where data for an input to the arithmetic and logic unit is temporarily stored.

Q.53 Statement (I): The count-up overflow (OV) bit is 1 when the up-counter increments above the maximum positive value.

Statement (II): The count-down underflow (UN) bit is 1 when the counter decrements below the minimum negative value.



Answers		Microprocessor, Microcontroller, PLC						
1. (a)	2. (b)	3. (a)	4. (d)	5. (a)	6. (d)	7. (c)	8. (d)	9. (a)
10. (a)	11. (d)	12. (c)	13. (a)	14. (d)	15. (a)	16. (d)	17. (b)	18. (c)
19. (b)	20. (d)	21. (a)	22. (b)	23. (d)	24. (c)	25. (d)	26. (a)	27. (d)
28. (d)	29. (c)	30. (a)	31. (c)	32. (a)	33. (d)	34. (d)	35. (c)	36. (b)
37. (b)	38. (a)	39. (c)	40. (a)	41. (a)	42. (b)	43. (d)	44. (d)	45. (a)
46. (d)	47. (c)	48. (d)	49. (a)	50. (b)	51. (a)	52. (c)	53. (c)	

Explanations Microprocessor, Microcontroller, PLC

1. (a)

Static RAM

- Never refreshed
- Fast
- More expensive
- Require 4 or 6 transistor along with some wiring

Dynamic RAM

- Frequent refresh
- Slow
- Less expensive
- Require a transistor and a capacitor

2. (b)

Program counter : In microprocessor program counter (PC) hold address of the next instruction which is to be fetched.

3. (a)

DRAM offers reduced power consumption as the information is stored in capacitor fastest.

Associative memory is more expensive than RAM because each all must have an extra storage capability as well as logic circuits formatting its content with external arrangement.

4. (d)

Program counter (PC) : It is a 16 bit register which is user accessible. It keeps the track of address of the next instruction to be fetched from memory for execution

5. (a)

Number of memory location in each chip = 2^{12}

Number of bits in each chip = $2^{12} \times 4$ bits

Total number of bits in memory system

- Q.1** Which statements is/are correct about robot?
1. Robots have repeatable precision of all times.
 2. Robots can perform multiple tasks simultaneously.
 3. Robot lacks capability to respond in emergencies.
- (a) 1 and 2 only (b) 2 and 3 only
(c) 3 and 1 only (d) All the above
- Q.2** 1st law of robotics states that
- (a) A robot may not injure humanity or through inaction; allow humanity to come to harm.
 - (b) A robot may not injure a human being or through inaction, allow a human being to come to harm; unless this would violate a higher law.
 - (c) A robot must obey orders given to it by human beings, except where such orders would come conflict with a higher order.
 - (d) None of these
- Q.3** According to Denavit-Hartenberg notations, offset of link is defined as the
- (a) Distance between two X axes measured along Z axis.
 - (b) Distance between two Z axes measured along X axis.
 - (c) Distance between two Y axes measured along X axis.
 - (d) Distance between two Y axes measured along Z axis.
- Q.4** Which of the following places would be least likely to include operational robots?
- (a) Ware house
 - (b) Factory
 - (c) Chemical research laboratories
 - (d) Private home
- Q.5** Which of following statement is correct?
1. General purpose robots has 6 degree of freedom.
 2. Redundant robot has more than 6 degree of freedom.
- (a) 1 only (b) 2 only
(c) Both 1 and 2 (d) Neither 1 nor 2
- Q.6** SCARA robot has
- (a) 3 degree of freedom
 - (b) 4 degree of freedom
 - (c) 6 degree of freedom
 - (d) More than 6 degree of freedom
- Q.7** SCARA acronym stand for
- (a) Selective compliance assembly robot arm
 - (b) Selective compliance articulated robot arm
 - (c) Both (a) and (b)
 - (d) None of these
- Q.8** In serial robot
- (a) Kinematic structure take the form of open loop chain.
 - (b) Kinematic structure take the form of closed loop chain.
 - (c) Kinematic structure take either the form of open loop chain or closed loop chain.
 - (d) None of these
- Q.9** Which of the basic part of robot unit would include the computer circuitry that could be programmed to determine what robot would do?
- (a) Controller (b) Arm
 - (c) End effector (d) Drive
- Q.10** Which of the following basic component of robot often a mechanical unit that manipulate the end effector and does actual work of robot?
- (a) End effector (b) Arm
 - (c) Actuator (d) Controller
- Q.11** A robot the sensor that defects weather the robot has been pressed, bumped or released is
- (a) Light sensors
 - (b) NXT brick sensor
 - (c) Touch sensor
 - (d) Ultrasonic sensor

Answers Robotics

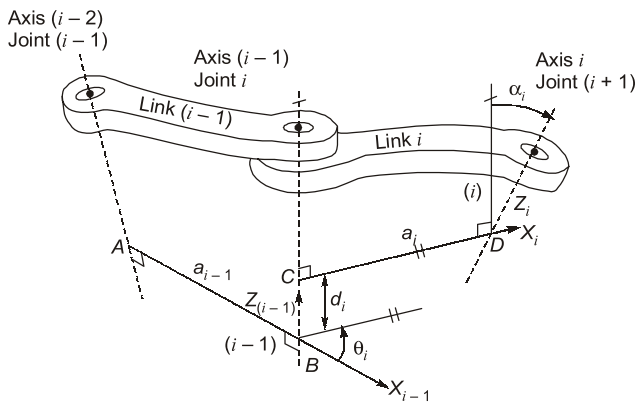
- | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (b) | 3. (a) | 4. (d) | 5. (c) | 6. (b) | 7. (c) | 8. (a) | 9. (a) |
| 10. (b) | 11. (c) | 12. (a) | 13. (c) | 14. (d) | 15. (a) | 16. (b) | 17. (d) | 18. (c) |
| 19. (c) | 20. (d) | 21. (a) | 22. (d) | 23. (c) | 24. (b) | 25. (d) | 26. (b) | 27. (a) |
| 28. (c) | 29. (c) | 30. (a) | 31. (a) | 32. (b) | 33. (a) | 34. (b) | 35. (c) | 36. (b) |
| 37. (c) | 38. (b) | 39. (d) | 40. (b) | 41. (b) | 42. (a) | 43. (a) | 44. (a) | 45. (a) |
| 46. (d) | 47. (c) | 48. (c) | 49. (b) | 50. (a) | 51. (c) | 52. (c) | 53. (c) | 54. (a) |
| 55. (b) | | | | | | | | |

Explanations Robotics

2. (b)

- Asimov proposed 3.law of robotics and later the zeroth law.
- 1st Law:** A robot may not injure a human being or though inaction, allow a human being to come to harm, unless this would violate a higher law.

3. (a)



DH convention for assigning frames to links and identifying joint-link parameters

It is a joint distance (d_i) which is measured along Z_{i-1} -axis from the origin of frame $(i - 1)$ point B to the intersection of x_i -axis with Z_{i-1} -axis i.e. BC .

4. (d)

Operational robots are generally used in areas such as industries, ware house, factory, scientific research centre, chemical research laboratories.

5. (c)

General purpose robot generally has 6 doF and redundant robot can have degree of freedom more than 6.

6. (b)

- SCARA robot is based on 4 axis design. Its arm is rigid in z-axis and flexible in xy-axes, which allowed it to adjust to holes in xy-axes.
- SCARA robot is the jointed two-link arm arrangement similar to human arm.

7. (c)

- SCARA acronym stands for selective compliance assembly robot arm or selective compliance articulated robot arm.
- It is 4 degree of freedom robot.
- It has jointed two-link arm arrangement similar to human arm.

8. (a)

Serial robot kinematic structure takes the form of open-loop chain.

9. (a)

All robots have following basic components:

- Manipulator (i.e. arm, end effector)
- Feedback device
- Actuators
- Controller brains of robot control all movements of manipulator and end effector
- Power supply

10. (b)

Manipulators often called arm is a mechanical unit that manipulate the end effectors and does actual work of robot.

The manipulators are composed of mechanical linkage and joints with actuators to drive the mechanism directly or indirectly through gears, chains or ball screws.