



B.E. DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Sixth Semester

MECHATRONICS ENGINEERING

U15MCT505: Industrial Automation I

COURSE OUTCOMES

- CO1:** Describe the concept of fluid power and use symbols of various components used in fluid power
CO2: Outline the importance of PLC, DCS, SCADA in industrial automation
CO3: Design fluid power circuits by selecting appropriate control valves and actuators
CO4: Describe the hardware and architecture of PLCs and also identify the analogy of relay logic components
CO5: Write PLC program using ladder diagram for simple applications
CO6: Summarize the common faults and troubleshooting methods for fluid power circuits
CO7: Summarize various maintenance procedures practiced in industry for PLC based control systems

Time: Three Hours

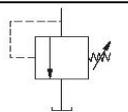
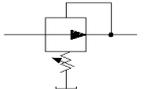
Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Match the following List-I (Fluid power Symbols) with List-II (Component Names)

CO1 [K₁]

Fluid power Symbols	Component Names
	Pressure relief valve
	Check valve
	Unloading valve
	Pressure reducing valve

A B C D

- a) ii i iii iv
 b) ii i iv iii
 c) ii iv iii i
 d) iii I ii iv

2. DCS stands for ----- CO2 [K₁]
- a) Distributed Contact System b) Digital Contact System
c) Digital Control System d) Distributed Control System
3. Which of the following valve(s) are known as memory valves CO3 [K₂]
1. Solenoid operated DCVs 2. Push button operated DCVs
3. Pilot operated DCVs 4. Foot pedal operated DCVs
- a) 1,3 b) 1,4
c) 1,2 d) 2,3
4. Shuttle valve is also called as CO3 [K₂]
- a) OR valve b) AND valve
c) NOR valve d) EX-OR valve
5. Assertion (A): Accumulator can be used as an emergency power source in hydraulic circuits. CO3 [K₂]
Reason (R): Accumulator provides required pressure source when the pump stops.
- a) Both A and R are Individually true and b) Both A and R are Individually true but
R is the correct explanation of A R is not the correct explanation of A
c) A is true but R is false d) A is false but R is true
6. The horizontal line in the PLC ladder diagram is known as CO5 [K₁]
- a) Contact b) Terminal
c) Rung d) Power supply
7. Find out the correct order of arranging the following components to construct a hydraulic CO3 [K₂]
system (from bottom to top) :
1. Control valves 2. Filter 3. Tank 4. Pump 5. Actuator
- a) 2-3-4-1-5 b) 1-3-2-4-5
c) 3-2-4-1-5 d) 4-1-3-2-5
8. Contamination from foreign objects, sludge and dirt that may cause CO6 [K₂]
- a) Vibration b) Friction and noise
c) Over-heating d) All of the above
9. Assertion (A): PLC provides more flexibility than relay logic circuits. CO4 [K₂]
Reason (R): Relay logic circuits requires hardwiring changes if the logic changed.
- a) Both A and R are Individually true and b) Both A and R are Individually true but
R is the correct explanation of A R is not the correct explanation of A
c) A is true but R is false d) A is false but R is true

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|-----|---|-----|--------------------|
| 10. | The problems related to I/O modules or I/O devices of a PLC are called as | CO7 | [K ₂] |
| a) | Internal problems | b) | External problems |
| c) | Intermediate problems | d) | Grounding problems |

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

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|-----|--|-----|-------------------|
| 11. | Draw the symbols of
(i) Single Pilot operated 3/2 DCV (ii) Double Solenoid operated 4/2 DCV | CO1 | [K ₂] |
| 12. | List out any four benefits of automation in industries. | CO2 | [K ₂] |
| 13. | Differentiate DCS and SCADA. | CO2 | [K ₂] |
| 14. | Enumerate the functions of intensifier. Draw the symbol of it. | CO3 | [K ₂] |
| 15. | What do you mean by telescopic cylinder? Where it can be used? | CO3 | [K ₂] |
| 16. | State the sequence followed by a PLC when carrying out a program. | CO5 | [K ₂] |
| 17. | Distinguish between relay and solenoid. | CO4 | [K ₂] |
| 18. | Write short notes on retentive timer? Give one application of it. | CO5 | [K ₂] |
| 19. | Why screw pumps produces less noise in fluid power applications? | CO7 | [K ₂] |
| 20. | What are the limitations of Ladder programming? | CO6 | [K ₂] |

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

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|-----|--|-----|-----|-------------------|
| 21. | (i) Distinguish between hydraulics and pneumatics | (7) | CO1 | [K ₂] |
| | (ii) Enumerate the applications of fluid power systems. | (7) | | |
| 22. | (i) Explain the construction and working of an external gear pump. | (7) | CO3 | [K ₂] |
| | (ii) Explain the construction and working of a 5/2 Direction control valve. | (7) | | |
| 23. | Explain the following applications of accumulator with circuits | | CO3 | [K ₂] |
| | (i) Accumulator as an auxiliary power source. | (7) | | |
| | (ii) Accumulator as a hydraulic shock absorber. | (7) | | |
| 24. | Select the suitable components and design a pneumatic circuit for the sequential operation A+B+A-B- of two cylinders A and B.(+ and – denotes extension and retraction respectively) | | CO3 | [K ₃] |

25. Draw the architecture of PLC and explain about the various components of it. CO4 [K₂]
26. (i) Classify and discuss about the various types of timers in PLC with suitable (7) CO4 [K₂]
examples.
(ii) Draw and explain the operation of electro-hydraulic circuit with PLC ladder (7) CO5 [K₃]
program to control the continuous reciprocation of a double acting cylinder.
27. (i) Classify the various faults occur in PLCs. How will you diagnose and troubleshoot (8) CO6 [K₂]
the same?
(ii) List any four failures occur in fluid power system and mention the causes for it. (6) CO7 [K₂]
