

B.E/B.TECH DEGREE EXAMINATIONS: NOV /DEC 2024

(Regulation 2018)

Fourth Semester

MECHATRONICS ENGINEERING

U18MCI4201: Hydraulics and Pneumatics

COURSE OUTCOMES

- CO1: Describe the concept of fluid power and different types of fluid power systems.
- CO2: Explain the working principles of different types of hydraulic pumps.
- CO3: Discuss the working principles of different types of hydraulic actuators.
- CO4: Summarize the working principles of compressors and pneumatic components.
- CO5: Design hydraulic and pneumatic circuits for simple applications.
- CO6: Explain the concept of fluid logic control systems, maintenance of fluid power systems.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

- 1. Under what situation, electrical, mechanical and fluid power transmissions are suitable? CO1 [K₁]
- 2. Draw the graphics symbols for the following pumps? CO1 [K₂]
 - (a) Fixed displacement bidirectional pump
 - (b) Variable displacement unidirectional pump.
- 3. A positive displacement pump has an overall efficiency of 87% and volumetric efficiency of 93%, what is its mechanical efficiency? CO2 [K₃]
- 4. What are the advantages of a telescope cylinders? CO2 [K₁]
- 5. Highlight the need of using an accumulator in hydraulic circuits. CO3 [K₂]
- 6. Write the functions of a solenoid Valve? CO3 [K₂]
- 7. How can you specify an air compressor? CO4 [K₁]
- 8. What is meant by an air-over-oil system? CO5 [K₁]
- 9. Define the terms 'Lap' and 'Null' with respect to servo valves. CO6 [K₁]
- 10. List the components present in PLC? CO6 [K₁]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

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|-----|----|---|----|-----|-------------------|
| 11. | a) | Compare and contrast hydraulic, pneumatic and electromechanical power systems? | 10 | CO1 | [K ₂] |
| | b) | List any six desirable properties for a good hydraulic system. | 6 | CO1 | [K ₁] |
| 12. | a) | Illustrate the working principle, construction and operation of external gear pump with a suitable diagram | 10 | CO2 | [K ₂] |
| | b) | Describe the advantages and limitations of an external gear pump and state three applications of it. | 6 | CO2 | [K ₂] |
| 13. | a) | Illustrate the construction and working of double acting cylinder and write its application. | 8 | CO3 | [K ₂] |
| | b) | Illustrate the construction and operation of a Vane motor with a suitable diagram? | 8 | CO3 | [K ₂] |
| 14. | a) | Describe various selection criteria for pneumatic components. | 6 | CO4 | [K ₂] |
| | b) | What is a compressor? Explain the working principle of piston type compressor with a neat sketch? | 10 | CO4 | [K ₁] |
| 15. | | Three pneumatic cylinders A, B, and C are used in an automatic sequence of operation. A cylinder extends, B cylinder extends, B cylinder retracts and then A cylinder retracts, C cylinder extends and C cylinder retracts. Develop pneumatic circuits by cascade method. | 16 | CO5 | [K ₃] |
| 16. | a) | Illustrate the components present in a PLC with a block diagram and give their functions. | 8 | CO6 | [K ₂] |
| | b) | What is meant by ladder programming? Draw the basic standard symbols that are used in a ladder diagram. Also, show rungs in a ladder diagram? | 8 | CO6 | [K ₁] |
