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## Question Paper Code : 21299

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Fourth / Fifth Semester

Mechanical Engineering

ME 3492 – HYDRAULICS AND PNEUMATICS

(Common to: Automobile Engineering and Mechanical Engineering (Sandwich))

(Regulations 2021)

Time : Three hours                                      Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the various methods for transmitting fluid power?

2. Define Pascal Law.

3. Explain the devices which convert hydraulic energy to mechanical energy.

4. Which method of flow control is used in feeding grinder tables, welding, and milling machine?

5. In what application two-hand safety circuits are used?

6. What are the functions of accumulator?

7. 0.9 m³ air at temperature 30° is heated to 72°. How much does the air expand?

8. What are some common applications of fluidics and pneumatic logic circuits?

9. How pneumatic logic circuit is used to control the operation of machinery?

10. What are some common types of sensors used in low-cost automation, and what are their typical applications and advantages in these systems?

PART B — (5 × 13 = 65 marks)

11. (a) What are some potential implications of Pascal's Law for the design and operation of hydraulic systems, and how might these implications influence the decision-making process of engineers and technicians in this field? Explain.

Or

(b) With a neat sketch, explain the working principle, construction, application, and limitation of an unbalanced vane pump.

12. (a) Classify the flow control valve with examples and how it is different from direction control valves.

Or

(b) What are some Key factors to consider when selecting a hydraulic actuator for a specific application, and how might these factors influence the performance and efficiency of the overall hydraulic system? Explain.

13. (a) A hydraulic cylinder is to compress a car body in 20 seconds. The operation requires a stroke of 6 m and a force of 60,000N. If a 10 N/mm² pump has been selected, then calculate the pump flow and hydraulic power capacity in kW.

Or

(b) What are some potential advantages and disadvantages of using open-loop versus closed-loop hydraulic systems? How may these variables, affect the decision to choose a given system for a particular application? Explain.

14. (a) How do electro-pneumatic systems differ from purely pneumatic systems, and what are some advantages and disadvantages of using electro-pneumatic systems? Explain.

Or

(b) What is the cascade method of designing fluid power circuits, and how does it differ from other methods of circuit design? Explain.

15. (a) How can a systematic troubleshooting approach be applied to identify and resolve common problems that arise in hydraulic and pneumatic systems, and what are some examples of real-world applications where this approach has been successfully implemented? Explain.

Or

(b) What are some basic factors that should be considered when selecting a low cost automation technique for a specific industrial application, and why are these factors important? Explain.

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PART C — (1 × 15 = 15 marks)

16. (a) Design an automobile crusher. The crushing force is required in such that a 20 cm diameter cylinder is required at a working pressure of 127 kg/cm². Time for crushing is about 20 sec. and the stroke required to flatten, the automobile is 255 cm. Compare the power requirements of a circuit without and with an accumulator. Specification of the Gas loaded accumulator

Time taken for charging = 6 mins

Initial pressure of charging = 85 kg/cm²

Charged pressure of accumulator = 210 kg/cm²

Minimum pressure for crushing = 127 kg/cm²

Or

(b) How can the integration of advanced sensing, control, and data analytics technologies enhance the performance and efficiency of hydraulic and pneumatic systems in various applications, and what are the key challenges and opportunities associated with this integration? Explain.

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