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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER M.TECH DEGREE EXAMINATION
Electronics & Communication Engineering - Interdisciplinary Engineering
(Robotics & Automation)
04EC6905 - Fluid Power Automation

Time: 3 hrs   Max. Marks: 60

PART A
(Answer all questions. Each question carry 3 marks).

1. Why centrifugal pumps are rarely used in fluid power systems? (3)

2. When is a telescopic cylinder used? (3)

3. What do you mean, when a flow control valve is said to be pressure compensated? (3)

4. State on the working of a single stage servo valve? (3)

5. Compare hydraulic system and pneumatic system? (3)

6. List the broad rules followed for the selection of a working medium in fluid power system? (3)

7. What is meant by bit logic operations in relation to a PLC? (3)

8. How are timer delay valves classified? (3)

PART B
(Each full question carries 6 marks).

9. A pump has a displacement volume of 150 cm^3. It delivers 0.0020 m$^3/s$ at 1500 RPM and (6) 80 bar. If the prime mover input torque is 150 Nm, what is the overall efficiency of the pump? What is the theoretical torque required to operate the pump. The pump is driven by an electric motor having an overall efficiency of 88%. The hydraulic system operates 14 hours/day for 300 days per year. The cost of electricity is Rs 7 per KWh. Determine the yearly cost of electricity to operate the hydraulic system. Determine the amount of the yearly cost of electricity that is due to the inefficiencies of the electric motor and pump?

OR

10. Name and explain the components of a hydraulic system with their functions. State the (6) advantages & disadvantages of hydraulic power system and state some applications of the same?

11. With a neat sketch explain the types of hydraulic cylinders? (6)

OR

12. A 10cm diameter hydraulic cylinder has a 5cm rod. If the cylinder receives flow at 150 (6) LPM and 15 MPa, find the (i) extension and retraction speeds, (ii) extension and retraction load carrying capacities, (iii) hydraulic pressure during extending and retracting stroke, (iv) cylinder kW power during extension and retracting stroke?

13. A pressure relief valve contains a poppet with an area of 5 cm^2 on which the system pressure (6) acts. During assembly, a spring with a spring constant of 3500 N/cm is installed in the valve to hold the poppet against its seat. The adjustment mechanism is then set so that the spring is initially compressed to 0.5 cm from its free length condition. Inorder to pass full pump flow through the valve at the pressure relief valve pressure setting, the poppet must move 0.30 cm from its fully closed position. (i) Determine the cracking pressure, (ii) Determine the full pump flow pressure, (iii) What should be the initial compression of the spring in pressure relief valve if the full pump flow is to be 40% greater than the cracking pressure?

OR

14. With neat sketches explain check valves and state its advantages and disadvantages? (6)

15. With a neat sketch explain the working of a single stage spool type servo valve? (6)

OR

16. With a neat block diagram explain Electro-hydraulic propotional valve? (6)

17. Design and analyse a double acting cylinder controlled by a 4/3 manually operated DCV? (6)

OR

18. Design and explain the hydraulic power circuit for sequencing the following operation in a (6) drilling machine. (i) Hold the work piece. (ii) Drilling the work piece. (iii) Unhold the work piece?

19. A small single acting cylinder is to extend and clamp a work piece when a push button is (6) pressed. As long as the push button is activated, the cylinder should remain in the clamped position. If the push button is released, the clamp is to retract. Use an additional start button. Draw the schematic diagram of the same?

OR

20. Briefly explain the structure of a PLC? (6)