

CBCS SCHEME

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15ME72

Seventh Semester B.E. Degree Examination, July/August 2021

Fluid Power System

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. State Pascals law. Explain in brief the advantages and applications of fluid power systems. (08 Marks)
b. Explain in brief any EIGHT desirable properties of hydraulic fluids. (08 Marks)
- 2 a. Explain the following:
(i) Static and Dynamic seals.
(ii) Sealing materials.
(iii) Effect of temperature on hydraulic fluid. (09 Marks)
b. What is a strainer? With a neat sketch explain proportional type filter. (07 Marks)
- 3 a. Explain the construction and working of balanced vane pump with neat sketch. Also explain the performance characteristics of a vane pump. (12 Marks)
b. A hydraulic motor has a volumetric displacement of 125 cm^3 and a pressure rating of 150 bar. It receives flow rate of $0.0015 \text{ m}^3/\text{s}$ from a pump. Find the (i) Motor speed
(ii) Theoretical torque and (iii) Theoretical power. (04 Marks)
- 4 a. What is hydraulic actuator? Explain Telescopic cylinder and cushioning cylinder with the help of neat sketch. (08 Marks)
b. Explain the following :
(i) Pump selection factor.
(ii) Application of accumulators. (08 Marks)
- 5 a. Explain the construction and working of compound relief valve with a neat sketch. Give the symbolic representation of relief valve. (08 Marks)
b. Explain the following with neat circuits:
(i) Sequencing circuit.
(ii) Force multiplication. (08 Marks)
- 6 a. Explain the pressure compensated flow control valve with neat sketch. (05 Marks)
b. What is synchronization of cylinders? Explain how synchronization of cylinders is achieved using matched pump and by using flow control valves with neat circuits. (11 Marks)
- 7 a. With the help of a block diagram, explain the pneumatic system. Also mention the advantages. (08 Marks)
b. Write a note on FRL unit. (04 Marks)
c. Explain the impact cylinder with a neat sketch. (04 Marks)
- 8 a. Explain the following :
(i) Quick exhaust valve.
(ii) Time delay valve.
(iii) Twin pressure valve. (12 Marks)
b. Write a note on characteristics of compressed air. (04 Marks)

- 9 a. Discuss the supply air throttling and exhaust air throttling types of speed control of cylinders. (10 Marks)
b. Explain the use of relay and contactors. (06 Marks)
- 10 a. Discuss the motion diagram and control diagram types of functional diagram. (12 Marks)
b. Write a note on use of logic gates. (04 Marks)

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CBCGS SCHEME

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15ME73

Seventh Semester B.E. Degree Examination, July/August 2021

Control Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. Define control system. Compare open loop and closed loop control system with an example. (08 Marks)
 b. What are the requirements of an Ideal Control System? (08 Marks)
- 2 Explain with Block diagrams:
 - (i) Proportional controller. (ii) Integral controller.
 - (iii) Derivative controller. (iv) P.I.D controller. (16 Marks)
- 3 a. Draw F-V and F-C circuits using analogue quantities. (08 Marks)

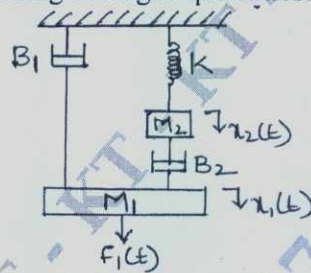


Fig. Q3 (a)

- b. Determine the overall transfer function of a block diagram shown in Fig. Q3 (b). (08 Marks)

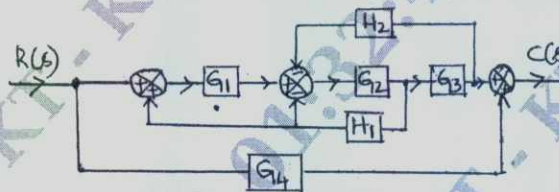


Fig. Q3 (b)

- 4 a. Determine the transfer function of field controlled DC motor which relates output angular displacement (θ) with input voltage (e_f). (08 Marks)
 b. Obtain the overall TF of SFG given:

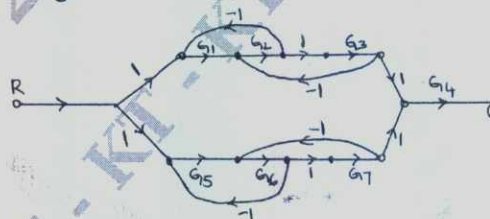


Fig. Q4 (b)

- 5 a. Discuss the various standard inputs used in control system analysis. (04 Marks)
 b. Derive the response equation of 1st order system for unit step input. (06 Marks)
 c. Applying RH criterion, discuss the stability of closed loop system as a function of K for the following OLTF,

$$G(s)H(s) = \frac{K(s+1)}{s(s-1)(s^2+4s+16)}$$

(06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 6 Sketch the Root locus plot for $G(s)H(s) = \frac{K}{s(s+2)(s+4)(s+6)}$. For what values of K, the system becomes UNSTABLE. (16 Marks)
- 7 a. Sketch the Polar plot for the transfer function, $G(s) = \frac{1}{(1+s)(1+2s)}$. (06 Marks)
 b. Apply Nyquist stability interior to the system with loop transfer function,
 $G(s)H(s) = \frac{4s+1}{s^2(1+s)(1+2s)}$. Ascertain its stability. (10 Marks)
- 8 For a unity feedback system with OLTF, $G(s) = \frac{40(s+5)}{s(s+10)(s+2)}$. Draw the Bode plot and determine : GM, PM, ω_{gc} , ω_{pc} . Comment on the stability of the system. (16 Marks)
- 9 a. Write down the characteristics of,
 (i) Lag compensator
 (ii) Lead compensator.
 (iii) Lag-lead compensator. (09 Marks)
 b. Define : (i) State (ii) State vector (iii) Controllability (iv) Observability (07 Marks)
- 10 a. Find the controllability and observability of the system described by the state equation:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 3 & 0 \\ 2 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u;$$

$$y = [1 \ 0]x.$$
 (08 Marks)
 b. Explain the design of lead compensator using Root locus (procedure only). (08 Marks)

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15ME753

Seventh Semester B.E. Degree Examination, July/August 2021 Mechatronics

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. Define Mechatronics, give its origin. (04 Marks)
b. Briefly describe proximity sensor. (08 Marks)
c. Explain with the sketch photo emissive transducers. (04 Marks)
- 2 a. Define following terms:
(i) Accuracy.
(ii) Resolution.
(iii) Response time
(iv) Setting time. (08 Marks)
b. Explain the working principal of Hall Effect sensor and its application in fluid level detection with a sketch. (08 Marks)
- 3 a. What is microprocessor? Explain its role in mechatronics. (04 Marks)
b. Differentiate microprocessor and micro controller. (04 Marks)
c. Explain with a block diagram the following with respect to general form of microprocessor system:
(i) Databus
(ii) Control bus
(iii) Address bus (08 Marks)
- 4 a. With the help of block diagram of 8085 A processor architecture. Explain terminologies related to it. (12 Marks)
b. Write a note on classification of microcontroller. (04 Marks)
- 5 a. With help of neat sketch, explain pneumatic actuators. (08 Marks)
b. Write a note on functional requirement of Robot. (08 Marks)
- 6 a. List and explain different parts of Robot controller. (08 Marks)
b. What is PLC? Explain with neat sketch basic structure of PLC. (08 Marks)
- 7 a. Sketch and explain the working of stepper motor. (08 Marks)
b. Explain briefly the following solid state devices which can be used to electronically switch circuits:
(i) Diodes (ii) MOSFET. (08 Marks)
- 8 a. With the help of neat sketch, explain working principle of DC motor. (08 Marks)
b. What is a mechanical actuator? List the various types of mechanical actuators. (08 Marks)
- 9 a. With a neat sketch, explain ball type check valve. (08 Marks)
b. Explain briefly meter-out circuit. (08 Marks)
- 10 a. Explain briefly meter-in circuit. (08 Marks)
b. With neat sketch, explain pressure compensated flow control valve. (08 Marks)

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