

CBCS SCHEME

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17ME71

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024 Energy Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With a neat sketch, explain working of spreader stokers and list their limitation. (10 Marks)
b. Explain hydraulic ash handling system with a neat sketch. (07 Marks)
c. List the disadvantages of pulverised fuel. (03 Marks)

OR

- 2 a. Explain various draught system used at chimney. (12 Marks)
b. Explain :
i) Economiser
ii) Air preheater. (08 Marks)

Module-2

- 3 a. With a neat sketch explain general layout of diesel engine. (08 Marks)
b. Explain various method of starting diesel engine. (06 Marks)
c. Explain thermohyphm cooling with a neat sketch. (06 Marks)

OR

- 4 a. Draw general layout of hydropower plant. (06 Marks)
b. How hydroelectric power plant are classified? (04 Marks)
c. With the help of neat sketch, explain pumped storage hydroelectric power plant and define hydrograph. (10 Marks)

Module-3

- 5 a. Explain with neat sketch solar electric plant. (10 Marks)
b. Explain working principle of solar cell and their advantages. (10 Marks)

OR

- 6 a. With a neat sketch, explain solar flat plate collector. (10 Marks)
b. Explain pyranometer with neat sketch to measure solar radiations. (10 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.

Module-4

- 7 a. Explain with neat sketch an horizontal wind mill. (10 Marks)
b. Wind at 1 standard atmospheric pressure and 15°C has a velocity of 15m/s. The turbine has diameter of 120m and operating speed in 40 rpm at maximum efficiency calculate :
i) Total former density
ii) Maximum power density
iii) Obtainable power density assume $\eta = 35\%$
iv) Total power. (10 Marks)

OR

- 8 a. What is tidal power and explain with neat sketch double basin power plant. (10 Marks)
b. Explain method of harnessing tidal energy. (10 Marks)

Module-5

- 9 a. Explain factors affecting on biogas generation. (06 Marks)
b. How gasifiers classified? Explain with neat sketch down draft gasifier. (10 Marks)
c. Explain :
i) Photosynthesis
ii) Anaerobic fermentation. (04 Marks)

OR

- 10 a. Explain with a neat sketch liquid dominated geothermal system. (10 Marks)
b. Explain :
i) Fuel cell
ii) MHD (Magneto hydro Dynamics). (10 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024 Fluid Power Systems

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Write the advantages, disadvantages and application of fluid power system in detail. (10 Marks)
- b. List six basic components required in a hydraulic power system with neat sketch and state the essential function of each. (10 Marks)

OR

- 2 a. What is a filter? With the aid of sketch, explain the following: (10 Marks)
- i) Return line filtering.
 - ii) Suction line filtering
 - iii) Pressure line filtering
- b. Explain the working of reservoir system with neat sketch and also explain the importance of baffle plate in reservoir system. (10 Marks)

Module-2

- 3 a. How pumps are classified based on displacement? Explain pumping theory with neat sketch. (10 Marks)
- b. A pump has a displacement volume of 100cm^3 . It delivers $0.0015\text{m}^3/\text{s}$ at 1000rpm and 70 bars. If the prime mover input torque is 120N-m. (10 Marks)
- i) What is the overall efficiency of the pump?
 - ii) What is the theoretical torque required to operate the pump?

OR

- 4 a. Explain the working of intensifier with neat sketch. (10 Marks)
- b. A hydrostatic transmission on operating at 70 bar has following characteristics:

Hydraulic Pump

$$V_D = 82\text{cm}^3$$

$$N = 500\text{rpm}$$

$$\eta_v = 82\%$$

$$\eta_m = 88\%$$

Hydraulic Motor

$$N = 400\text{rpm}$$

$$\eta_v = 92\%$$

$$\eta_m = 90\%$$

$$V_D = ?$$

Determine displacement of motor and motor output torque. (10 Marks)

Module-3

- 5 a. Explain the simple pressure relief valve with graphical symbol. (10 Marks)
- b. Explain the working principle of four-way valve with a neat sketch. Illustrate the graphical symbol of the valve. (10 Marks)

OR

- 6 a. With a neat circuit diagram, explain the working of regenerative circuit. (10 Marks)
b. With a neat circuit diagram, explain the working of double pump hydraulic system. (10 Marks)

Module-4

- 7 a. Mention the advantages and limitations of pneumatic system and also differentiate between hydraulic and pneumatic system. (10 Marks)
b. Explain the following with neat sketch:
i) Chemical Dryer
ii) Air lubricators. (10 Marks)

OR

- 8 a. What is FRL unit in pneumatic system? Explain its functions with symbolic representation. (10 Marks)
b. Explain with neat diagram the construction and working of a '3/2 poppet valve'. (10 Marks)

Module-5

- 9 a. Explain 'Supply air throttling' and 'exhaust air throttling' used in speed control of cylinders. (10 Marks)
b. Explain sequence control of two double-acting cylinder in pneumatic system with neat circuit diagram. (10 Marks)

OR

- 10 a. Explain a typical pneumatic circuit based on 'AND' logic function using two pressure valve. (10 Marks)
b. Explain the working of a solenoid controlled pilot operated DCV. (10 Marks)

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17ME73

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024 Control Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define Control System. Explain with a schematic diagram working of manually operated closed loop control system. (10 Marks)
- b. Mention the comparisons of open loop and closed loop control system, with an example for each. (10 Marks)

OR

- 2 a. Explain with a general block diagram the working of automatic control system. (10 Marks)
- b. What are Controllers? Explain with block diagram PI and PID controllers. (10 Marks)

Module-2

- 3 a. Write the equilibrium equations for the mechanical system shown in Fig.Q3(a), hence obtain the F – I system.

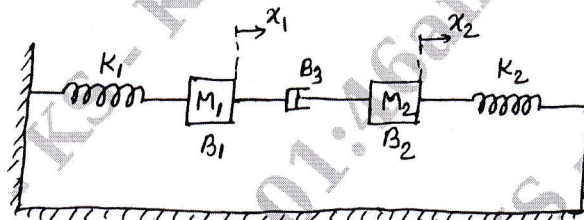


Fig. Q3(a)

- b. Derive the transfer function of liquid level system with interaction. (10 Marks)

OR

- 4 a. Reduce the block diagram shown in Fig.Q4(a) and obtain C(s)/R(s). (10 Marks)

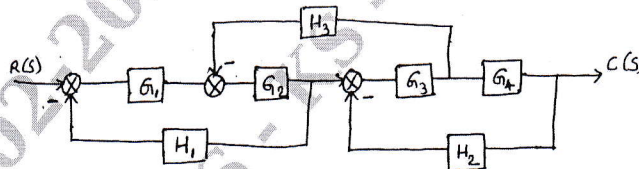


Fig. Q4(a)

- b. Find the transfer function by using Mason's gain formula for the signal flow graph shown in Fig.Q4(b). (10 Marks)

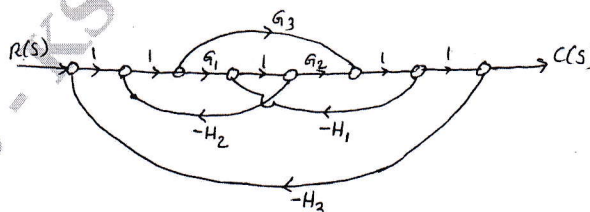


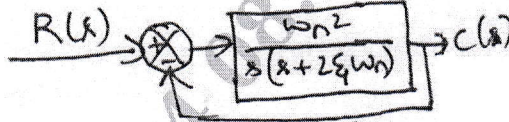
Fig. Q4(b)

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Module-3

- 5 a. Define : i) Time response ii) Transient response iii) Steady-state response. (08 Marks)
- b. Consider the system shown in Fig. Q5 (b), where $\xi = 0.5$, $\omega_n = 4$ rad/sec. Find
i) ω_d ii) t_r iii) t_p iv) M_p v) t_s . (12 Marks)

Fig. Q5(b)

**OR**

- 6 Sketch the Root locus for the system with unity feedback system and whose open loop transfer function is $G(s) = \frac{K}{s(s^2 + 6s + 10)}$. (20 Marks)

Module-4

- 7 Draw the Bode plot for a system having $G(s)H(s) = \frac{100}{s(s+1)(s+2)}$. Find:
i) Gain margin ii) Phase margin iii) Gain cross over frequency
iv) Phase cross over frequency and comment on stability. (20 Marks)

OR

- 8 a. Draw the polar plot and ascertain the nature of stability for system with open loop transfer function $G(s)H(s) = \frac{12}{(s+1)(s+2)(s+3)}$. (10 Marks)
- b. Draw the Nyquist plot for a system with open loop transfer function $G(s)H(s) = \frac{1}{s(1+2s)(1+s)}$ and comment on stability. (10 Marks)

Module-5

- 9 a. What is Compensator? How are the compensators classified? (08 Marks)
- b. Explain Lead compensator. (06 Marks)
- c. Explain Lead-lag compensator. (06 Marks)

OR

- 10 a. A system is governed by the differential equation

$$\frac{d^3y}{dt^3} + \frac{6d^2y}{dt^2} + \frac{11dy}{dt} + 10y = 8u(t)$$

Where y is the output and u is the input of the system. Obtain a state space representation of the system. (08 Marks)

- b. Determine the state controllability and observability of the system described by :

$$\dot{X} = \begin{bmatrix} -3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} X + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix} u, \quad Y = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix} X.$$

(12 Marks)

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17ME753

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024 Mechatronics

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Why mechatronics is important to industrial automation? Explain the applications of mechatronics. (10 Marks)
- b. What are the merits and demerits of mechatronics? (10 Marks)

OR

- 2 a. Define transducer and sensor. List the difference between transducer and sensors. (08 Marks)
- b. Explain light sensors, proximity switch and hall effect sensors. (12 Marks)

Module-2

- 3 a. With block diagram, explain the basic elements of a closed loop control system. (12 Marks)
- b. Differentiate between microprocessor and micro controller. (08 Marks)

OR

- 4 a. With diagram, explain the configuration of Intel 8085A microprocessor. (14 Marks)
- b. Related to microprocessor explain with block diagram of BUS. (06 Marks)

Module-3

- 5 a. What is PLC? Briefly explain the basic structure of PLC with a neat sketch. (10 Marks)
- b. Define ladder programming. Also explain ladder diagram with a neat sketch. (10 Marks)

OR

- 6 a. Briefly explain advanced actuators with a neat sketch. (10 Marks)
- b. With a neat sketch, briefly explain functional requirements of robot. (10 Marks)

Module-4

- 7 a. Explain the Ratchet and pawl mechanism. (08 Marks)
- b. Briefly explain the type of motions involved with mechanical systems. (06 Marks)
- c. Derive mechanism state the functions of mechanism in the mechatronic system. (06 Marks)

OR

- 8 a. Explain the working principle of a D.C. motor. (10 Marks)
- b. Describe the working of a relay. (10 Marks)

Module-5

- 9 a. Briefly explain pressure relief valve with a neat sketch. (10 Marks)
- b. With a neat sketch, illustrate different valve actuator symbols for hydraulic and pneumatic systems. (10 Marks)

OR

- 10 a. Write short notes on : i) Check valve ii) Needle valve. (10 Marks)
- b. Sketch and explain the working principle of a hydraulic system. (10 Marks)

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