

CBCS SCHEME

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17ME71

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

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Explain with sketch, overfeed and underfeed principle of firing coal. Mention their advantages and disadvantages. (10 Marks)
- b. Draw a line diagram of pneumatic ash handling system and explain its working. Mention its advantages. (10 Marks)
- 2 a. What are the function of i) Super heater ii) Economiser iii) Air preheater iv) Cooling tower v) Re - heater. (10 Marks)
- b. What do you understand by the term draught? Classify types of draughts. Explain with a neat sketch the balanced draught. (10 Marks)
- 3 a. List the applications of diesel electric power plant and explain with neat sketch air intake and exhaust system. (10 Marks)
- b. Explain the necessity of the cooling system in a diesel engine. With the help of neat diagram, explain the working of Thermostat cooling. (10 Marks)
- 4 a. Define i) Hydrograph ii) Flow duration curve iii) Surge tank iv) Water hammer. (10 Marks)
- b. The run off data of a River at a particular site is tabulated below :

Month	Mean discharge in millions of m ³ /month	Month	Mean discharge in millions of m ³ /month
Jan	40	July	70
Feb	25	August	100
March	20	Sept	105
April	10	October	60
May	0	Nov	50
June	50	Dec	40

- i) Draw hydrograph and find the mean flow.
- ii) Draw flow duration curve.
- iii) Find the power is MW available at mean flow, if the head available is 100m and overall efficiency of generation is 80%. (10 Marks)
- 5 a. What is Beam radiation? Name solar radiation measuring instruments and explain with neat sketch pyrheliometer for measuring beam radiation. (10 Marks)
- b. Give classification of solar collectors. Explain with a neat sketch, solar flat plate collector. (10 Marks)
- 6 a. Write short note on :
 - i) Solar pond
 - ii) Solar Air heater. (10 Marks)
- b. Sketch and explain Vapour absorption solar Refrigeration system. (10 Marks)

- 7 a. Explain with neat sketch, vertical axis type wind mill. (10 Marks)
- b. A 10m/sec wind is at 1 standard atm pressure and 15°C temperature. Calculate
- The total power density in the wind stream.
 - The maximum obtainable power density.
 - A reasonable obtainable power density.
 - The total power in KW produced if the turbine diameter is 120m.
 - The Torque if the turbine operating at 40 rpm and maximum efficiency of 40%. (10 Marks)
- 8 a. How Tidal power plants are classified? Draw a neat sketch and explain the working of double basin Tidal power plant. (10 Marks)
- b. Write short note on the following :
- Wave Energy.
 - Advantages and disadvantages of Tidal power plant. (10 Marks)
- 9 a. What is meant by Anaerobic digestion? What are the factors which affect biodigestion? Explain any two in brief. (10 Marks)
- b. How are the gasifiers classified? With a neat sketch, explain the working of downdraft gasifier. (10 Marks)
- 10 a. Write short note on the following :
- Fuel cell
 - Disposal of Nuclear waste. (10 Marks)
- b. What is Green Energy? With a neat sketch, explain the closed cycle OTEC system. (10 Marks)

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17ME72

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

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Explain with neat sketch, the basic hydraulic power system. (08 Marks)
b. What are the different materials used for sealing? Explain. (08 Marks)
c. Brief the various advantages of fluid power system. (04 Marks)
- 2 a. Define Pascal's law and explain hydraulic press with a sketch. (06 Marks)
b. Explain any four properties of hydraulic fluids. (08 Marks)
c. With a neat sketch, explain the working of hydraulic filter. (06 Marks)
- 3 a. With a neat sketch, explain the working principle of external gear pump. (06 Marks)
b. Explain the working of double acting cylinder with a neat sketch. (08 Marks)
c. A vane pump has a volumetric displacement of 82 cm^3 . It has a rotor diameter of 5 cm, a cam ring diameter of 7.5 cm, and a vane width of 4 cm, what must be the eccentricity? What is the maximum volumetric displacement? (06 Marks)
- 4 a. Sketch and explain the working of a swash plate type piston motor. (06 Marks)
b. Explain any four pump selection parameters. (08 Marks)
c. A hydraulic motor has a 100 cm^3 volumetric displacement. It has a pressure rating of 140 bar, and receives oil from $0.001 \text{ m}^3/\text{sec}$ theoretical flow rate pump. Find the motor speed, theoretical torque, theoretical kW power. (06 Marks)
- 5 a. Classify the DCV on the basis of center position with symbol. (05 Marks)
b. Explain the working of shuttle valve with a sketch. (05 Marks)
c. With a neat circuit, explain the sequencing hydraulic circuit and its application. (10 Marks)
- 6 a. With a neat sketch, brief the working of check valve. (05 Marks)
b. Differentiate between meter-in and meter-out circuit. (05 Marks)
c. Explain with a circuit, the application of regenerative circuit. (10 Marks)
- 7 a. Brief the advantages and disadvantages of pneumatic system. (06 Marks)
b. Explain the working of tandem cylinders with a neat sketch. (06 Marks)
c. With a neat sketch, explain the sliding spool type of valve. (08 Marks)
- 8 a. Explain with a sketch, the basic pneumatic power system. (08 Marks)
b. Brief the working of quick exhaust valve with a sketch. (06 Marks)
c. Brief the working of memory valve with sketch. (06 Marks)
- 9 a. With a suitable pneumatic circuit, explain the indirect control of single acting cylinder. (10 Marks)
b. Explain the configuration of AND gate with logic equation, truth table and pneumatic symbol. (10 Marks)
- 10 a. Explain the sequencing of two cylinders A and B using cascading method circuit for the cylinder sequence $A^+ B^+ B^- A^-$. (10 Marks)
b. Explain the configuration of OR gate with logic equation, truth table and pneumatic symbol. (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.

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17ME73

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

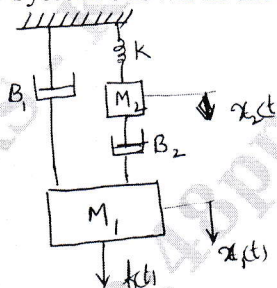
Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

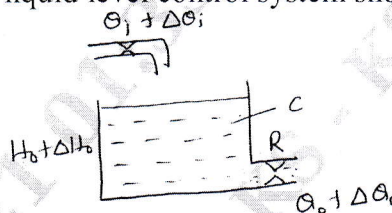
1. a. Define Control System. Explain with a schematic diagram working of manually operated closed loop control system. (10 Marks)
 b. Mention the companions of open loop and closed loop control system, with an example for each. (10 Marks)
2. a. Explain with a general block diagram the working of automatic control system. (10 Marks)
 b. What are controllers? Explain with block diagram PI and PID controllers. (10 Marks)
3. a. Draw the equivalent mechanical system and write the set of equilibrium equations and obtain force voltage analogy for the system shown in the Fig.Q.3(a). (12 Marks)

Fig.Q.3(a)



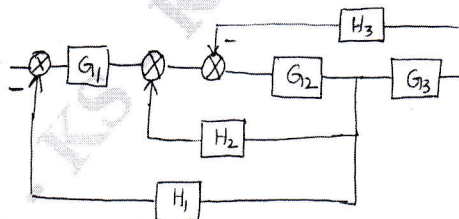
- b. Obtain the transfer function of liquid level control system shown in the Fig.Q.3(b). (08 Marks)

Fig.Q.3(b)



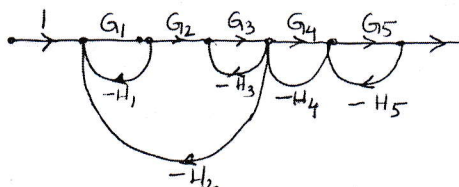
4. a. Derive the transfer function of the system shown in Fig.Q.4(a) using block diagram reduction technique. (10 Marks)

Fig.Q.4(a)



- b. Determine the overall transfer function of the signal flow graph shown in the Fig.Q.4(b) using Masons gain formula. (10 Marks)

Fig.Q.4(b)



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- 5 a. A unity feedback control system is characterized by an open loop transfer function.
 $G(S) = \frac{10}{s^2 + 2s + 6}$, determine the following, when the system is subjected to a unit step input
 i) Undamped natural frequency ii) Damping ratio iii) Peak time iv) Settling time v) Peak overshoot. (10 Marks)
- b. By applying Routh's criterion discuss the stability of the closed loop system whose characteristic equation is
 $s^6 + 3s^5 + 4s^4 + 6s^3 + 5s^2 + 3s + 2 = 0$ (10 Marks)
- 6 Sketch the complete Root locus for the system having
 $G(s)H(s) = \frac{K}{s(s+3)(s^2 + 3s + 11.25)}$ and comment on stability. (20 Marks)
- 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)
- 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)
- 9 a. Explain series and feedback compensation with block diagrams. (12 Marks)
- b. Explain controllability and observability with reference to control system. (08 Marks)
- 10 a. Explain the following terms:
 i) State ii) State variable iii) State vector iv) State space v) State equation. (10 Marks)
- b. Discuss lag compensator, sketch the bode plot of a lag compensator. (05 Marks)
- c. Discuss lead compensator, sketch the bode plot of lead compensator. (05 Marks)

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17ME753

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

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. What is mechatronics? Draw the block diagram of basic elements of a mechatronic system. (06 Marks)
b. Briefly explain about evolution of mechatronics. (06 Marks)
c. List out the objectives, advantages, disadvantages and applications of mechatronics. (08 Marks)
- 2 a. Define sensor and transducer. Briefly explain Eddy current proximity sensor with a neat sketch. (10 Marks)
b. Explain Hall effect transducer with a neat sketch. (10 Marks)
- 3 a. Explain basic elements of microprocessor based control system with a neat sketch. (10 Marks)
b. Sketch and explain the architecture of Intel's 8085A microprocessor. (10 Marks)
- 4 a. Define the following terms:
(i) Memory (ii) Address. (iii) I/O and peripheral devices
(iv) Assembler (v) Registers (10 Marks)
b. Briefly explain microcontrollers and mention at least two differences between microprocessors and microcontrollers. (10 Marks)
- 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)
- 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)
- 7 a. Briefly explain translation motion and rotational motion. (10 Marks)
b. Explain Gear Ratio calculation with a neat sketch. (10 Marks)
- 8 a. Name any four important solid state switches and explain any one in detail. (10 Marks)
b. Explain solenoids in detail. (10 Marks)
- 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)
- 10 a. Write short notes on:
(i) Check valve. (10 Marks)
(ii) Needle valve. (10 Marks)
b. Sketch and explain the working principle of a hydraulic system. (10 Marks)

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