

# CBCS SCHEME

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15ME71

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019

## Energy Engineering

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Explain with neat sketch, Spreader Stokers. (08 Marks)  
b. What is Pulvarised coal? What are the advantages and limitations of Pulvarised coal? (08 Marks)

OR

- 2 a. Explain with neat sketch, Cyclone Burner. (08 Marks)  
b. Explain Forced draught system. (08 Marks)

### Module-2

- 3 a. Explain with neat sketch air intake and exhaust system. (08 Marks)  
b. List the advantages, limitation and application of Diesel Power Plant. (08 Marks)

OR

- 4 a. How the Hydel power plants are classified and explain with neat sketch Pumped storage plant? (07 Marks)  
b. Define i) Hydrograph ii) Flow duration curve iii) Surge tank. (09 Marks)

### Module-3

- 5 a. What is Beam Radiation? Explain working principle of Pyrheliometer for measuring beam radiation. (08 Marks)  
b. The incident beam of sunlight has a power density of  $1\text{ kW/m}^2$  in the direction of beam. The angle of inclination is  $60^\circ$ . Calculate the power collected by the surface having a total area of  $120\text{ m}^2$ . (08 Marks)

OR

- 6 a. Explain with neat sketch, working principle of a solar cell. (08 Marks)  
b. Explain three Basic methods of Thermal Energy Storage. (08 Marks)

### Module-4

- 7 a. Explain with neat sketch, Verticle axis type wind mill. (08 Marks)  
b. Wind at 1 standard atmospheric pressure and  $15^\circ\text{C}$  temperature has a velocity of  $15\text{ m/s}$  with turbine operating speed of  $40\text{ rpm}$  at maximum efficiency. Assume turbine diameter  $120\text{ m}$ . Calculate i) Total power density in the wind stream ii) The maximum obtainable power density iii) A reasonably obtainable power density @  $\eta = 35\%$  iv) Total power. (08 Marks)

OR

- 8 a. How Tidal power plants are classified and what are the limitations of Tidal power plant? (09 Marks)  
b. Explain Fundamental characteristics of Tidal power plant selection. (07 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-5**

- 9 a. Write short notes on :  
i) Photo synthesis      ii) Energy plantation.      (08 Marks)  
b. With neat sketch, explain down draft gasifier.      (08 Marks)

**OR**

- 10 a. What is Fuel cell? How fuel cells are classified?      (08 Marks)  
b. What is Green energy? What are the benefits of green energy?      (08 Marks)

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# CBCS SCHEME

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15ME72

## Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019 Fluid Power Systems

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. What are the desirable properties of hydraulic fluids explain any five? (08 Marks)  
b. Explain types of filtering methods and filters. (08 Marks)

OR

- 2 a. State Pascal's law. Explain Pascal's law applied to hand operated jack. (08 Marks)  
b. Explain basic structure of hydraulic system. (08 Marks)

### Module-2

- 3 a. Explain pumping theory and what are factors considered for selecting hydraulic pump. (08 Marks)  
b. Explain external gear pump. (04 Marks)  
c. A gear pump has a 75 mm outside diameter a 50 mm inside diameter and a 25 mm width. If the volumetric efficiency is 90% at rated pressure, what is the corresponding actual flow rate? The pump speed is 1000 rpm. (04 Marks)

OR

- 4 a. Explain balanced vane motor. (04 Marks)  
b. Explain Swash plate type piston motor. (04 Marks)  
c. A hydraulic motor has a displacement of  $130 \text{ cm}^3$ , operates with a pressure of 105 bar and has a speed of 2000 rpm. If the actual flow rate consumed by the motor is  $0.05 \text{ m}^3/\text{s}$  and the actual torque delivered by the motor is 200 N-m, find  
(i) Volumetric efficiency  
(ii) Mechanical efficiency  
(iii) Overall efficiency.  
(iv) Power developed by motor in kW. (08 Marks)

### Module-3

- 5 a. Explain Pilot operated pressure control valve. (06 Marks)  
b. Explain 4-way spool valve. (05 Marks)  
c. Explain needle flow control valve. (05 Marks)

OR

- 6 a. Explain regenerative circuit. (06 Marks)  
b. Explain hydraulic circuit with accumulator for any one application. (05 Marks)  
c. Write symbols for,  
(i) Pressure relief valve.  
(ii) Pressure reducing valve.  
(iii) Counter balance valve. (05 Marks)

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**Module-4**

- 7 a. What are the advantages of Pneumatic system? (05 Marks)  
b. Explain cylinder cushioning. (05 Marks)  
c. Explain supply air throttling and exhaust air throttling. (06 Marks)

**OR**

- 8 a. Explain construction of single and double acting cylinder. (06 Marks)  
b. Explain FRL circuit. (05 Marks)  
c. Explain characteristics of compressed air. (05 Marks)

**Module-5**

- 9 a. Explain following functions generated in Pneumatic systems,  
(i) OR gate (ii) AND gate (iii) NOT gate. (12 Marks)  
b. Explain quick exhaust valve with symbol. (04 Marks)

**OR**

- 10 a. With neat sketch, explain electropneumatic control of double acting cylinder. (08 Marks)  
b. Explain with neat sketch coordinated sequence motion of two cylinders. (08 Marks)

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15ME73

## Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019 Control Engineering

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Define control system. Explain open and closed loop control systems with examples. (08 Marks)
- b. With block diagram, explain:
  - i) Proportional controller
  - ii) Integral controller
  - iii) Proportional plus differential controller. (08 Marks)

OR

- 2 a. List the advantages and disadvantages of open loop and closed loop control system. (08 Marks)
- b. Explain requirements of automatic control system. (08 Marks)

### Module-2

- 3 a. Obtain differential equation and hence get transfer function for mechanical system shown in Fig.Q.3(a). (08 Marks)

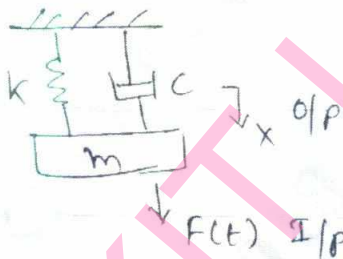


Fig.Q.3(a)

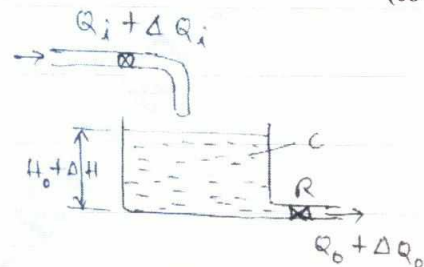
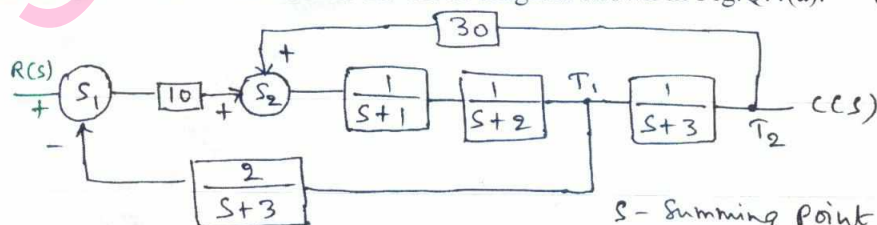


Fig.Q.3(b)

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

OR

- 4 a. Obtain the overall transfer function for the block diagram shown in Fig.Q.4(a). (08 Marks)

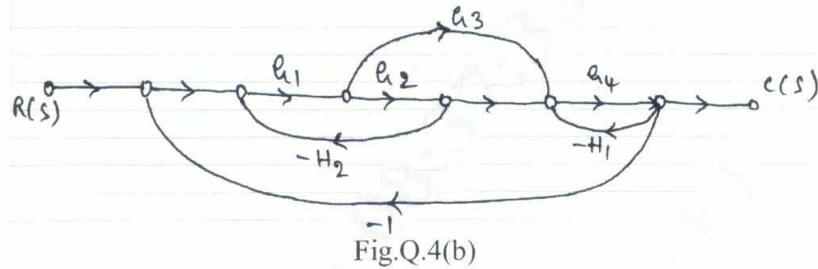


S - Summing point  
T - Take off point

Fig.Q.4(a)

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- b. Find the transfer function for the signal flow graph shown in Fig.Q.4(b) by using Mason's gain formula. (08 Marks)



**Module-3**

- 5 a. A unity feedback system has  $G(s) = \frac{40(s+2)}{s(s+1)(s+4)}$ . Determine: i) Type of system  
 ii) All error coefficients iii) Error for ramp input with magnitude 4. (08 Marks)  
 b. The time response of a second order system for unit step input is  $c(t) = 1 + 0.2e^{-60t} - 1.2e^{-10t}$ . Determine: i) Closed loop transfer function ii) Undamped natural frequency and damping ratio. (08 Marks)

**OR**

- 6 Sketch the root locus for the system with  $G(s)H(s) = \frac{K(s+4)}{s(s^2 + 2s + 2)}$ . (16 Marks)

**Module-4**

- 7 Draw the Bode plot for a system having  $G(s)H(s) = \frac{100}{s(s+1)(s+3)}$ . Find: i) Gain margin ii) Phase margin iii) Gain crossover frequency iv) Phase cross over frequency. (16 Marks)

**OR**

- 8 a. Draw the polar plot and ascertain the nature of stability for OLTF.  $G(s)H(s) = \frac{12}{(s+1)(s+2)(s+3)}$ . (08 Marks)  
 b. For a system with open loop T.F.  $G(s)H(s) = \frac{1}{s(1+2s)(1+s)}$ . Comment on stability of the system by Nyquist plot. Also find gain margin in dB. (08 Marks)

**Module-5**

- 9 a. Explain series and feed back compensation with block diagrams. (08 Marks)  
 b. Write note on gain and phase cross over frequency gain and phase margin in polar plot. (08 Marks)

**OR**

- 10 a. Define the terms: i) State ii) State variables iii) State vector iv) State space. (08 Marks)  
 b. Determine the state controllability and observability of the system described by

$$\dot{x} = \begin{bmatrix} -3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} x + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix} u \quad y = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} x$$

(08 Marks)

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# CBCS SCHEME

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15ME742

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019

## Tribology

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Briefly explain the history of Tribology. (08 Marks)  
b. With a neat sketch, explain any two practical importance of Tribology. (08 Marks)

OR

- 2 a. What is the importance of Lubricant? Explain the requirements of a good lubricant. (10 Marks)  
b. At the bottom of a uniform cylindrical vessel of 30cm height a horizontally capillary tube of 2mm inner diameter and 10cm length is connected to discharge the liquid. Calculate the rate of discharge of the liquid. If the vessel contains  
i) Water of viscosity 0.01 poise and ii) Oil of viscosity 0.84 poise to 2/3 capacity. Take density of water and oil as 1 gm/cc and 0.9 gm/cc respectively. (06 Marks)

### Module-2

- 3 a. What are the theories friction and explain any two theories and test measurement? (08 Marks)  
b. How do you classify mechanism of wear and explain any one measurement of Test method? (08 Marks)

OR

- 4 a. What is Delamination theory and explain? (08 Marks)  
b. Write short notes on friction of metals and non – metals. (08 Marks)

### Module-3

- 5 a. Derive Petroff's equations for lightly loaded journal bearings. State assumptions. (08 Marks)  
b. Determine Load carrying capacity, Frictional force and power loss due to friction for an Ideal full Journal bearing for the following specifications :  
Diameter of Journal = 5 cm ; Speed of Journal = 1200 rpm ; Length of bearing = 6.5cm  
Radial clearance = 0.0025cm ; Average viscosity =  $1.6 \times 10^{-6}$  Renolds ; Attitude = 0.8. (08 Marks)

OR

- 6 a. With a neat sketch, explain Partial Journal Bearing and Effect of End leakage. (06 Marks)  
b. A Journal bearing of width 1m operates with a shaft of 100mm diameter which rotates at 1200 rpm. The diametral clearance is 200  $\mu$ m and absolute viscosity of the lubricating oil is an at inlet temperature of 20°C is 40 Cp for an eccentricity ratio of 0.7. Calculate the minimum film thickness, Attitude angle, Maximum film pressure , location load capacity and co-efficient friction. (10 Marks)

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**Module-4**

- 7 a. Derive an equation for maximum pressure distribution for a plane slider bearing given by  

$$P_m = \frac{\eta u \ell}{h_0^2} \bar{P}_m$$
, with usual notations. (08 Marks)
- b. A fixed inclined pad thrust bearing of length 100mm and width 50mm, with a minimum film thickness of 50  $\mu\text{m}$ , operates at a sliding velocity of 1m/s with a mineral oil of absolute viscosity of 30 Cp. Calculate the i) Maximum pressure and location ii) Normal load capacity and iii) Stiffness of the oil. Take  $m = 1.889$ . (08 Marks)

**OR**

- 8 a. Derive an equation for load carrying capacity of Hydro static lubrication. (08 Marks)
- b. A Hydrostatic thrust bearing with a circular step pad has an outside diameter of 400mm and recess diameter of 250mm.  
 i) Calculate the pressure for a thrust load of 100kN.  
 ii) Find the volumetric flow rate of the oil which will be pumped to maintain the film thickness of 150  $\mu\text{m}$  with an viscosity of 30Cp and  
 iii) Calculate the film stiffness. (08 Marks)

**Module-5**

- 9 a. Name the commonly used Bearing materials and explain any two bearing material properties. (08 Marks)
- b. What are the advantages and disadvantages of Bearing materials? (03 Marks)
- c. Write a note on Scope of Surface Engineering. (05 Marks)

**OR**

- 10 Write a short note on the following :  
 a. Surface modification.  
 b. Thermo chemical process.  
 c. Vapor phase process.  
 d. Wear and Corrosion resistance. (16 Marks)

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# CBCS SCHEME

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15ME753

## Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019 Mechatronics

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. What is mechatronics? Brief evolution of mechatronics. (08 Marks)  
b. Write short notes on: (i) Proximity switch (ii) Hall effect sensor (08 Marks)

OR

- 2 a. Define transducer and classify it. Sketch and explain capacitive transducer. (08 Marks)  
b. Elaborate mechatronics a multidisciplinary scenario. State any two merits and demerits of mechatronics. (08 Marks)

### Module-2

- 3 a. What is a Register? Sketch and explain Program Counter. (08 Marks)  
b. Discuss the Basic Elements of Microprocessor based control system. (08 Marks)

OR

- 4 a. Sketch and explain a typical memory device of a microprocessor. (08 Marks)  
b. List out any four differences between Microcontroller and Microprocessor. (08 Marks)

### Module-3

- 5 a. Describe different parts of an Industrial fixed robot controller. (08 Marks)  
b. Define PLC. Sketch and explain the Basic PLC structure. (08 Marks)

OR

- 6 a. Discuss the functional requirements of a robot and state how sensors play a vital role in functioning of robots. (08 Marks)  
b. Write short notes on: (i) Pneumatic actuators (ii) Latching circuit (08 Marks)

### Module-4

- 7 a. Sketch and explain the working principle of an variable reluctance Stepper motor and state the specification of it. (08 Marks)  
b. Define the following and state any two application of it:  
(i) RELAY (ii) SOLENOID (iii) MOSFETS (iv) MOTOR (08 Marks)

OR

- 8 a. Explain the construction of a Ratchart and Pawl Mechanisms. (08 Marks)  
b. Draw and explain the types of belts used in belt drives for power transmission. (08 Marks)

### Module-5

- 9 a. Sketch and explain the working principle of a Hydraulic system. (08 Marks)  
b. What is Direction Control Valve? Explain the operations of a single solenoid valve. (08 Marks)

OR

- 10 a. With a neat sketch illustrate different valve actuator symbols for hydraulic and pneumatic systems. (08 Marks)  
b. Write a note on spool valve. (08 Marks)

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