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10ME/PM82

**Eighth Semester B.E. Degree Examination, June/July 2015**  
**Control Engineering**

Time: 3 hrs.

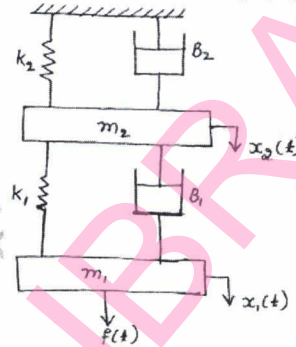
Max. Marks:100

**Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.**

**PART - A**

- 1 a. Distinguish between open loop and closed loop control systems, with suitable examples. (04 Marks)
- b. What are the ideal requirements of control system? (06 Marks)
- c. What is Control Action? Briefly explain proportional, proportional plus derivative and proportional plus derivative plus integral controllers, with the help of block diagrams. (10 Marks)
- 2 a. Obtain the differential equation for the mechanical system shown in fig. Q2(a) and draw the equivalent mechanical system, also draw the analogous electrical network based on i) Force – voltage analogy ii) Force – current analogy. (10 Marks)

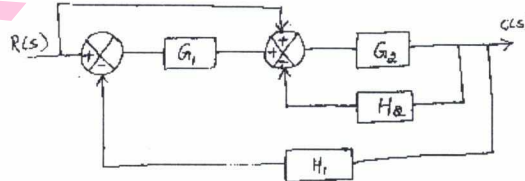
Fig.Q2(a)



- b. Derive the transfer function of an armature controlled DC motor. The field current is maintained constant during operation. Assume that the armature coil has back emf  $e_b = k_b \frac{d\theta}{dt}$  and the coil current produces a torque  $T = K_m I$  on the rotor,  $K_b$  and  $K_m$  are the back emf constant and motor torque constant respectively. (10 Marks)

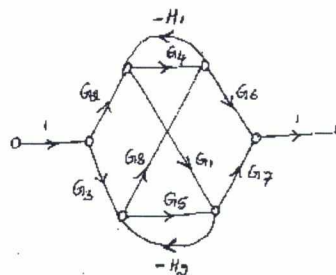
- 3 a. Reduce the block diagram shown in fig. Q3(a) to its simplest possible form and find its closed loop transfer function. (10 Marks)

Fig.Q3(a)



- b. Using Mason's gain formula, find the gain of the following system shown in fig. Q3(b). (10 Marks)

Fig.Q3(b)



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.

- 4 a. Derive an expression for the unit step response of first order system. (08 Marks)  
 b. A unity feedback system is characterized by an open loop transfer function  

$$G(s) = \frac{K}{s(s+10)}$$
. Determine the gain K, so that the system will have a damping ratio of 0.5.  
 For this value of k determine peak time, setting time and peak overshoot for a unit step input. (08 Marks)  
 c. Ascertain the stability of the system given by the characteristic equation  
 $S^5 + 4S^4 + 12S^3 + 20S^2 + 30S + 100 = 0$ , using R – H criteria . (04 Marks)

**PART - B**

- 5 a. Sketch the polar plot for the transfer function  

$$G(s) = \frac{10}{s(s+1)(s+2)}$$
. (10 Marks)  
 b. Apply Nyquist stability criterion to the system with transfer function.  

$$G(s) H(s) = \frac{4s+1}{s^2(1+s)(1+2s)}$$
 and ascertain its stability. (10 Marks)
- 6 Sketch the Bode plot for  

$$G(s) H(s) = \frac{2}{s(s+1)(1+0.2s)}$$
. Also obtain gain margin and phase margin and crossover frequencies. (20 Marks)
- 7 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? (20 Marks)
- 8 a. Explain the following : i) Lead compensator ii) Lag compensator. (12 Marks)  
 b. Determine the state controllability and observability of the system described by

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

$$Y = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} x.$$

(08 Marks)

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10ME831

**Eighth Semester B.E. Degree Examination, June/July 2015**  
**Tribology**

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.**  
**2. Use of machine design data hand book is permitted.**  
**3. Assume missing data suitably.**

**PART – A**

- 1 a. State Hagen-Poiseuille law and derive an expression for velocity distribution across the capillary tube. (10 Marks)  
b. Explain with a neat sketch construction and working of Ostwald viscometer and Saybolt viscometer. (10 Marks)
- 2 a. Derive an expression for friction force and coefficient of friction for lightly Loaded Journal bearing stating the assumption. (10 Marks)  
b. Explain with a neat sketch Tower's experiment. (10 Marks)
- 3 a. Explain with a neat sketch mechanism of pressure development in an oil film. (10 Marks)  
b. The following specification refers to a full journal bearing,  
Journal diameter = 60 mm, Bearing length = 75 mm, Journal speed = 2000 rpm,  
Radial clearance = 0.04 mm, Viscosity of lubricant = 0.01 PaSec,  
Eccentricity ratio = 0.8, Inlet pressure = 0.3 MPa, Location of inlet hole = 300°. Determine maximum and minimum pressure and their location. (10 Marks)
- 4 a. Derive an expression for load carrying capacity of an idealized plane slider bearing. (10 Marks)  
b. The following data refers to a slider bearing with pivoted shoe:  
Length of the bearing = 500 mm, Width of the bearing = 500 mm, Velocity of runner = 8 m/sec, Oil viscosity = 0.054 PaSec, Maximum and minimum film thickness = 0.15 mm and 0.075 mm. Determine (i) Load that may be carried by the bearing. (ii) Coefficient of friction (iii) Power loss. (10 Marks)

**PART – B**

- 5 a. Explain the importance of oil flow through journal bearing and typical designs of oil grooves in journal bearing. (10 Marks)  
b. A partial self contained 120° journal bearing has following specification,  
Journal diameter=87.5 mm, Bearing length=112.5 mm, Speed=480 rpm,  
Load on bearing = 31.78 kN, Diametrial clearance = 0.0875 mm,  
Ambient temperature = 32.2°C, Minimum oil film thickness = 0.013 mm,  
Lubricating oil = SAE40.  
Assuming that entire heat generated in the bearing is dissipated from bearing surface to the surrounding air. Determine i) Expected mean oil film temperature ii) Temperature of the bearing surface with average ventilation iii) Power loss. (10 Marks)

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- 6 a. Derive an expression for load carrying capacity of hydrostatic step bearing. (10 Marks)  
b. A hydro static step bearing has following specification:  
Shaft diameter = 130 mm, Pocket diameter = 55 mm, Shaft speed = 1800 rpm,  
Inlet pressure = 3.75 MPa, External pressure = 0, Expected oil temperature = 50°C  
Desirable oil film thickness = 0.00875 mm, Lubricating oil used = SAE60  
Determine : i) Load the bearing can support ii) The rate of flow through bearing  
iii) Power loss. (10 Marks)
- 7 a. Mention desirable properties of bearing material and explain any four commonly used bearing materials. (10 Marks)  
b. Classify wear. Explain wear of polymer and ceramic materials. (10 Marks)
- 8 a. Explain the three tribological measures to reduce friction and wear. (10 Marks)  
b. Explain with graphs the influence of speed, temperature and pressure on wear. (10 Marks)

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10ME833

**Eighth Semester B.E. Degree Examination, June/July 2015**  
**Power Plant Engineering**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting  
atleast TWO questions from each part.**

**PART – A**

- 1 a. What are the advantages of stoker firing? Explain the working of traveling grate stoker with a simple sketch. State its outstanding features. (10 Marks)
- b. What is pulverized coal? Explain the BIN system of handling pulverized coal with a neat diagram. List the advantages and disadvantages of using pulverized coal. (10 Marks)
- 2 a. Draw a neat diagram of velox boiler and explain its working and advantages. (10 Marks)
- b. Classify the ash handling system. Explain the working principle of mechanical handling system with neat sketch. (10 Marks)
- 3 a. Explain with sketch: i) Super heater; ii) Desuperheater. (08 Marks)
- b. Describe the working principle of natural draught cooling tower with neat sketch. (04 Marks)
- c. Explain the importance of cooling tower in a steam power plant. (02 Marks)
- d. Calculate the mass of flue gases flowing through the chimney when the draught produced is equal to 2.0cm of water. Temperature of flue gases is 290°C and ambient temperature is 27°C. The flue gases formed per kg of fuel burnt are 23kg. Neglect the losses and take the diameter of the chimney as 1.9m. (06 Marks)
- 4 a. Explain the necessity of cooling systems in diesel engine. What are the methods of cooling the engine? Explain. (06 Marks)
- b. Explain the importance of lubrication system in diesel power plant. (04 Marks)
- c. List at least six advantages and four disadvantages of diesel engine power plant. (05 Marks)
- d. Explain the working principle of closed cycle gas turbine with neat sketch. (05 Marks)

**PART – B**

- 5 a. What are the advantages and disadvantages of hydro electric plants? (08 Marks)
- b. Explain the following:
  - i) Hydrographs
  - ii) Storage and pondage
  - iii) Water hammer. (12 Marks)
- 6 a. With the help of sketch show all the important parts of nuclear reactor describing briefly the function of each part. (08 Marks)
- b. Explain the characteristic feature of a boiling water reactor. What do you mean by internal and external circulation? (08 Marks)
- c. Write short notes on disposal of radioactive wastes. (04 Marks)

- 7 a. Define the following terms:  
 i) Peak load    ii) Demand factor    iii) Load factor    iv) Diversity factor.    **(08 Marks)**
- b. What are considerations to be made while selecting the suitable site for a thermal and a nuclear power plants?    **(06 Marks)**
- c. A base load power station and stand by power station share a common load as follows:

Base load station annual output	= $180 \times 10^6$ kWh
Base load capacity	= 42 MW
Maximum demand on base load station	= 36 MW
Standby station capacity	= 22 MW
Standby station annual output	= $17 \times 10^6$ kWh
Maximum demand (peak load) on standby station	= 18 MW

Determine the following for both power stations i) Load factor    ii) Capacity factor.    **(06 Marks)**

- 8 a. Enumerate various type of tariff and explain any two of them.    **(08 Marks)**
- b. What are the objectives and requirements of tariff?    **(04 Marks)**
- c. Explain the performance and operating characteristics of power plant.    **(08 Marks)**

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10ME844

**Eighth Semester B.E. Degree Examination, June/July 2015**  
**Automotive Engineering**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
at least TWO questions from each part.**

**PART – A**

- 1 a. Explain the various methods of cylinder arrangements in multicylinder engines. (08 Marks)
- b. What do you mean by Swirl generation in CI engines? What are the different methods of Swirl generation? (06 Marks)
- c. What are the various methods of engine cooling? Explain with sketch the thermosyphon system of cooling. (06 Marks)
- 2 a. Explain with a neat sketch normal and abnormal combustion in SI engines. (06 Marks)
- b. Sketch and explain Zenith carburetor. (10 Marks)
- c. What are the octane and cetane numbers? (04 Marks)
- 3 a. What are the objectives of super charging and explain any two arrangements of supercharging. (10 Marks)
- b. What is the need of turbocharging? Explain any one method of turbo charging giving its merits and demerits. (10 Marks)
- 4 a. What are the requirements of ignition system? Sketch and explain battery ignition system. (10 Marks)
- b. What do you mean by ignition advance? Explain the following ignition advance methods:  
i) Centrifugal advance, ii) Vacuum advance. (10 Marks)

**PART – B**

- 5 a. Classify clutches (detailed classification). With neat sketch, explain working principle of friction clutches. (06 Marks)
- b. Explain necessity for gear ratios in transmission. (06 Marks)
- c. Explain working principle of automatic transmission. (08 Marks)
- 6 a. With a neat sketch, explain the torque tube drive. What are its merits over Hotch-Kiss drive? (08 Marks)
- b. Define the following and explain their effect on steering:  
i) Camber ii) King pin inclination  
iii) Castor iv) Toe in and Toe out (12 Marks)
- 7 a. What are the requirements of a suspension system? Explain air suspension system with sketch. (08 Marks)
- b. Explain with a neat sketch working of master cylinder. (08 Marks)
- c. Differentiate between disc brakes and drum brakes. (04 Marks)
- 8 a. Explain the controlling of crank case emissions, with sketch. (08 Marks)
- b. What are the methods used to reduce amount of pollutants in the exhaust gas? With neat sketch, explain exuast gas recirculation system. (08 Marks)
- c. What are catalytic converters? How they are helpful in reducing HC, CO and NO<sub>x</sub> emissions. (04 Marks)

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