AR13

CODE: 13CE2007 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, October-2021

HYDRAULICS AND HYDRAULIC MACHINERY

(Civil Engineering)

Time: 3 Hours **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) Write down an equation which is non-dimensional.
   b) What is meant by a model?
   c) Give one practical example for unsteady non uniform flow.
   d) Define specific energy of flow in an open channel.
   e) State momentum principle.
   f) When will be the hydraulic efficiency of a jet striking a single moving curved vane at the centre is maximum?
   g) Define specific speed of a turbine.
   h) What is the most susceptible part of a reaction turbine when it is subjected to cavitation?
   i) Differentiate a pump with that of a turbine.
   j) What is the function of impeller in a centrifugal pump?

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2. a) State Buckingham's π theorem. 4M
   b) What are the limitations and derivation of Rayliegh's method of dimensional analysis? 8M

(OR)

3. a) The critical depth ycr in a V-shaped channel depends upon the discharge Q, acceleration due to gravity g, and the vertex angle θ made by the two side walls of the channel. Using Buckingham's method of dimensional analysis, derive an equation for critical depth. 6M
   b) Explain about various dimensionless parameters and mention their significance. 6M

UNIT-II

4. a) Show that for a most economical trapezoidal channel section the hydraulic mean depth is half of the depth of flow. 5M
   b) A trapezoidal channel has sides of slopes of 1 horizontal to 2 vertical and the slope of the bed is 1 in 1500. The area of the section is 40m2. Find the dimensions of the section if it is most economical. Determine the discharge of the most economical section if C=50 7M

(OR)

5. a) What is meant by critical depth of flow in an open channel? What are the various ways of finding it? 6M
   b) Derive the relationship between specific energy and depth at critical flow condition in a rectangular open channel. 6M

UNIT-III

6. a) A jet of 75mm in diameter issues with a velocity of 30 m/s and impinges on a stationary flat plate which destroys its forward motion. Find the force exerted by the jet on the plate and work done. 4M

   b) A rectangular plate, weighing 60 N is suspended vertically by a hinge on the top horizontal edge, the centre of gravity of the plate is 100 mm from the hinge .A horizontal jet of water 20 mm diameter ,whose axis is 150 mm below the hinge impinges normally on the plate with a velocity of 5 m/s ,Determine: 8M

   1) The horizontal force applied at the center of gravity to maintain the plate in its vertical position. 2) The corresponding value of the jet, if the plate is deflected through 30^o and the same force continue to act at the centre of gravity of the plate.

(OR)

7. a) A jet of water strikes with a velocity of 35 m/s a flat plate inclined at 30^o with the axis of the jet .if the cross sectional area of the jet is 25 cm^2 , Determine:1) the force exerted by the jet on the plate ,2) the components of the force in the direction normal to the jet 3) the ratio in which the discharge gets divided after striking the plate. 8M

   b) A jet of water of 60mm diameter strikes a curved vane at its centre with a velocity of 18 m/s. The curved vane is moving with a velocity of 6m/s in the direction of the jet. The jet is deflected through an angle of 165^o. Assuming the plate to be smooth find the thrust on the plate in the direction of jet. 4M

UNIT-IV

8. a) Explain the working of Pelton Wheel with the help of a neat sketch. 6M

   b) What are the various Unit Quantities of turbines? Briefly explain about each of them. 6M

(OR)

9. a) Prove that the overall efficiency of a turbine is the product of hydraulic efficiency, mechanical efficiency and volumetric efficiency. 6M

   b) Derive the equation for specific speed of turbines. 6M

UNIT-V

10. a) Classify the centrifugal pumps 4M

    b) Explain with sketch the working of single stage centrifugal pump 8M

(OR)

11. a) Explain about various heads and efficiencies of a centrifugal pump. 8M

    b) How do you avoid cavitation in pumps? 4M

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CODE: 13EE2013 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech II Semester Supplementary Examinations, October-2021
LINEAR CONTROL SYSTEMS
(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

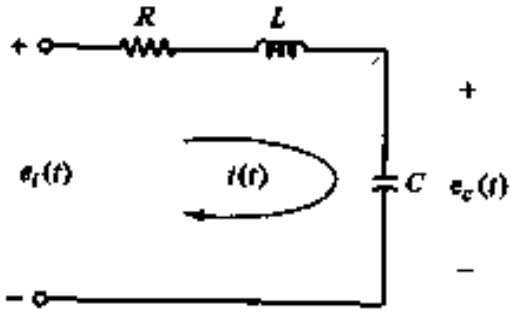
1. a) Draw the block diagram of an open-loop control system.
   b) Write the effect of feedback on overall gain.
   c) What are the time domain specifications?
   d) How do you reverse the direction of rotation in AC servomotor?
   e) What is the necessary and sufficient condition for stability?
   f) What are the advantages of Routh Criterion?
   g) What is the effect on polar plot if a non-zero pole is added to the transfer function?
   h) What are the specifications in frequency domain design?
   i) Explain about lead-lag compensator.
   j) Explain the concept of state and state variable.

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2. a) Derive the transfer function of a linear system given in the Fig. 6M



   b) Explain various block diagram elements of typical sensing devices of control system. 6M

(OR)

3. a) Draw and explain the block diagram of a turbine driven hydraulic power system. 6M
   b) Explain the step by step construction of the signal flow graph for the following set of algebraic equations. 6M

$$y_2 = a_{12}y_1 + a_{32}y_3$$
$$y_3 = a_{23}y_2 + a_{43}y_4$$
$$y_4 = a_{24}y_2 + a_{34}y_3 + a_{44}y_4$$
$$y_5 = a_{25}y_2 + a_{45}y_4$$

UNIT-II

4 Derive the transfer function and develop the block diagram of Armature controlled DC servo motor 12M

(OR)

5. a) Obtain the time response of a first order system for a unit step input and plot its response. 6M

b) Determine the step, ramp and parabolic error constants of the following unity feedback control system whose open loop transfer function is given by 6M

$$G(s) = \frac{1000}{(1+2S)(1+0.5S)}$$

UNIT-III

6. A unity feedback system has an open loop function $G(s) = \frac{K}{S(S^2+3S+10)}$ make a rough sketch of root locus plot by determining the following 12M

(i) Centroid, number and angle of asymptotes
(ii) angle of departure of root loci from the poles
(iii) Breakaway points if any
(iv) points of intersection with jw axis and
(v) maximum value of k for stability.

(OR)

7. Sketch the root locus plot of unity feedback system with an open loop transfer function 12M

$$G(s) = \frac{K}{S(S+1)(S+5)}$$

UNIT-IV

8. a) Find the Gain margin and phase margin of the system if the open loop transfer function 6M

is : $G(s) = \frac{10}{S(S+1)}$

b) Draw the polar plot of $G(s)H(S) = \frac{K}{S(S+3)(S+5)}$ and there from determine range of K for stability using Nyquist Criterion. 6M

(OR)

9. Consider a unity feedback system having an open loop transfer function $G(s) = \frac{K}{S(1+0.5S)(1+0.1S)}$ sketch the Bode plot 12M

UNIT-V

10. a) Explain the concept of state, state model, state variable, state space. 6M

b) Derive the transfer function for linear time invariant system from state model. 6M

(OR)

11. a) Explain the design procedure of lead compensator 6M

b) Design a lead compensator for the system with an open loop transfer function $G_f(s) = \frac{K}{S^2(1+0.1S)}$, for the specifications of K_a =10 and ϕ_{pm}=30^0. 6M

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CODE: 13ME2011 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech II Semester Supplementary Examinations, October-2021
THERMAL ENGINEERING - I
(Mechanical Engineering)

Time: 3 Hours **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) Define exhaust blowdown
   b) Explain why air standard efficiency is greater than actual efficiency
   c) Define cetane number
   d) List any two factors that effects knock in SI engines
   e) Define ignition delay
   f) List any two factors considered for designing of CI engine combustion chambers
   g) Define brake power
   h) Define mean effective pressure
   i) Define isothermal efficiency
   j) List any two types of rotary positive displacement pumps

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2. a) Explain the significance of Time loss factor and Heat loss factor in cycle analysis of IC engines — 6M
   b) Explain the loss due to gas exchange in IC engines — 6M

(OR)

3. a) Explain the construction and working of a battery ignition system with a neat sketch — 6M
   b) With a neat sketch explain the splash lubrication system stating its advantages and disadvantages. — 6M

UNIT-II

4. a) List and explain various factors that effect knock in SI engines — 6M
   b) Explain different types of combustion chamber used in SI engines with neat sketches — 6M

(OR)

5. a) List and elucidate the desirable characteristics of an SI engine fuel — 6M
   b) Explain the factors affecting flame propagation in SI engine — 6M

UNIT-III

6. Explain the stages of combustion in a CI engine with a neat pressure crank angle diagram. 12M

(OR)

7. a) Explain the formation of swirl in a CI engine combustion chamber 6M
   b) Describe the various factors affecting knock in CI engines 6M

UNIT-IV

8. From the data given below, calculate brake power and draw a heat balance sheet for a two-stroke diesel engine run for 20 minutes at full load: r.p.m. = 350 m.e.p. = 3.1 bar Net brake load = 640 N Fuel consumption = 1.52 kg Cooling water = 162 kg Water inlet temperature = 30°C Water outlet temperature = 55°C Air used/kg of fuel = 32 kg Room temperature = 25°C Exhaust temperature = 305°C Cylinder bore = 200 mm Cylinder stroke = 280 mm Brake diameter = 1 metre Calorific value of fuel = 43900 kJ/kg Steam formed per kg of fuel in the exhaust = 1.4 kg Specific heat of steam in exhaust = 2.09 kJ/kg K Specific heat of dry exhaust gases = 1.0 kJ/kg K. 12M

(OR)

9. A six cylinder, 4-stroke SI engine having a piston displacement of 700 cm^3 per cylinder developed 78 kW at 3200 r.p.m. and consumed 27 kg of petrol per hour. The calorific value of petrol is 44 MJ/kg. Estimate: (i) The volumetric efficiency of the engine if the airfuel ratio is 12 and intake air is at 0.9 bar, 32°C. (ii) The brake thermal efficiency, and (iii) The brake torque. For air, R = 0.287 kJ/kg K. 12M

UNIT-V

10. a) With a neat sketch explain the working of axial flow compressor 6M
    b) Following data relate to a performance test of a single-acting 14 cm × 10 cm reciprocating compressor: Suction pressure = 1 bar Suction temperature = 20°C Discharge pressure = 6 bar Discharge temperature = 180°C Speed of compressor = 1200 r.p.m. Shaft power = 6.25 kW Mass of air delivered = 1.7 kg/min Calculate the following: (i) The actual volumetric efficiency; (ii) The indicated power iii) the isothermal efficiency 6M

(OR)

11. Show that for 50% reaction the blades are symmetrical in a axial flow compressor 12M

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