Question Paper 2013

Mechanical Engineering

(Paper II)

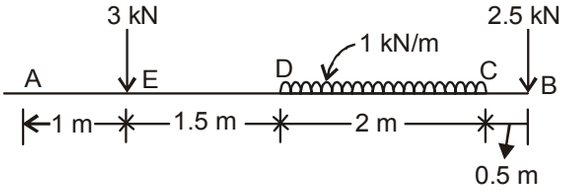
1. (*a*) Define four bar chain mechanism and state the Grashof's Law for the four bar chain linkage. (15)

(*b*) Compare the functions of flywheel and mechanical governor. (15)

(*c*) Determine power lost in overcoming friction and number of collars required for the thrust bearing whose contact surfaces have 20 cm and 15 cm as external and internal radius. The coefficient of friction is 0.08 between the surfaces. The total axial load is 30 kN. The intensity of pressure cannot exceed 3.5 bar and the shaft rotates with 420 rpm. (15)

(*d*) With the help of neat sketch define pressure angle for gear train and cam follower mechanisms. (15)

2. (*a*) A cantilever beam of length 5 m is loaded as shown in figure below. Draw the shear force and bending moment diagrams for the cantilever beam. (15)



(*b*) Determine the maximum shear stress induced in a solid circular shaft of diamater 15 cm when the shaft transmits 150 kW power at 180 rpm. (15)

(*c*) A thin walled pressure cylinder of internal diameter 1.25 m contains a fluid at an internal pressure of 2 N/mm^2. Determine the maximum thickness of the cylinder if: (15)

(*i*) The longitudinal stress is not to exceed 30 N/mm^2

(*ii*) The circumferential stress is not to exceed 45 N/mm^2

(*d*) Write the assumptions made in the Euler's column theory and define slenderness ratio. (10 + 5)

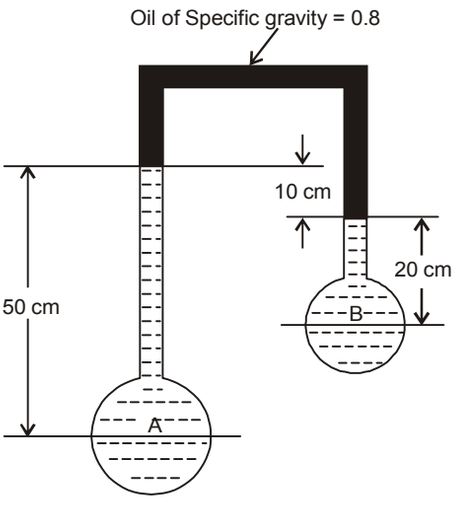
3. (*a*) With the help of P – V and T – s diagrams, describe Diesel Cycle. (15)

(*b*) Explain the vapour compression cycle with the help of flow, T – s and p – h diagrams. (15)

(*c*) Compare the fire tube and water tube boilers. (15)

(*d*) A cyclic heat engine operates between a source temperature of 723°C and sink temperature of 23°C. What is the least rate of heat rejection per kW net output of the engine? Also show the block diagram. (15)

4. (*a*) An inverted U-tube has been used to determine the difference of pressure in two pipes carrying water as shown in figure.



Determine the difference of pressures in the two pipes in terms of head of water and N/cm^2, if the difference of liquid level in inverted U-tube be 10 cm. (15)

(*b*) A venturimeter has an area ratio of 9 to 1, the larger diameter being 30 cm. During the flow, the recorded pressure head in the larger section is 6.5 meters and that at the throat 4.25 meters. If the meter coefficient, C is 0.99, compute the discharge through the meter. (15)

(*c*) Differentiate between impulse turbine and reaction turbine. (15)

(*d*) State the Bernoulli's theorem and write its limitations. (15)

5. (*a*) Describe the following heat treatment processes of steel: (15)

(*i*) Annealing

(*ii*) Normalizing

(*iii*) Case hardening

(*b*) With the help of neat sketch, describe a single point cutting tool and its signature according to American Standard System. (15)

(*c*) With the help of neat sketch, describe TIG and MIG. (15)

(*d*) Discuss various defects in castings based on

(*i*) Melting and pouring of molten metals and

(*ii*) Gating and risering of mould. (15)

6. (*a*) Briefly discuss the grinding wheel characteristics. (15)

(*b*) Compare the involute and cycloidal profiles of gear tooth. (15)

(*c*) Draw and briefly describe the Mollier's Chart. (15)

(*d*) State Kelvin – Planck and Clausius statement of 2nd Law of thermodynamics. (15)