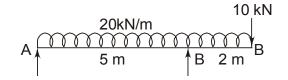# Question Paper 2007

Mechanical Engineering
(Paper II)

1. (*a*) Describe about Francis turbine with respect to its component parts. construction and operation. (20)

(*b*) Establish the ratio of forces exerted by a water jet when it is made to strike.

   (*i*) a stationary flat plate held normal to it;

   (*ii*) a flat plate moving in the direction of jet at one third the velocity of jet:

   (*iii*) a series of flat plates mounted on a wheel and moving at one third the velocity of jet. (10)

2. (*a*) Make a comparison of Otto, Diesel and Dual combustion cycle for–

   (*i*) maximum compression ratio and same heat input;

   (*ii*) constant maximum pressure and same heat input;

   (*iii*) same maximum temperature and pressure. (20)

(*b*) Explain the function and working of a simple carburetor with a neat sketch. (10)

3. (*a*) What are the advantages of using taper turning attachment in lathe? (5)

(*b*) Explain cutting speed, feed and depth of cut in case of lathe. (10)

(*c*) With a neat sketch, show the details of a tail-stock. (15)

4. (*a*) What are the various operations performed on milling machine? Explain plain milling, face milling and side milling. (15)

(*b*) Explain tool head of a shaper with the help of a neat sketch. (10)

5. (*a*) Explain the function of Hartnell governor. (5)

(*b*) With the help of a neat sketch, describe crank and slotted lever mechanism. (10)

(*c*) The external and internal radii of a friction plate of single clutch are 120 mm and 60 mm, respectively. The total axial thrust with which the friction surfaces are held together is 1500 N. For uniform wear, find the maximum, minimum and average pressure on the contact surfaces. (15)

6. (*a*) What are the assumptions of Euler's theory?

(*b*) Draw the BM and SF diagrams for the overhanging beam carrying loads as shown in the figure. Mark the values of the principal ordinates and locate the point of contra-flexure. (10)

(*c*) Three vertical rods equal in length and each 12 mm in diameter are equispaced in a vertical plane and together support a load of 1000 N, the equispaced in a vertical plane and together support a load of 10000 N, the rods being so adjusted as to share the load equally. If now an additional load of 10000 N be added, determine the stress in each rod. The middle rod is of copper and the outer rods are of steel. take $E_s = 2 \times 10^5$ N/mm^2 and $E_c = 1 \times 10^5$ N/mm^2.