OR

A multi-plate disc clutch transmits 55 kW of power at 1800 rpm. Coefficient of friction for the friction surfaces is 0.1. Axial intensity of pressure is not to exceed 160 kN/m^2. The external radius is 80 mm and is 0.7 times the external radius. Find the number of plates needed to transmit the required torque.

5. a) What is the effect of centrifugal tension on power transmission?

   b) Differentiate between a self-locking and self-energizing brake.

   c) Explain jump and cross-over shock for a cam.

   d) Design a set of stepped pulleys to drive a machine from a countershaft that runs at 220 rpm. The distance between centres of the two sets of pulleys is 2 m. The diameter of the smallest step on the countershaft is 160 mm. The machine is to run at 80, 100 and 130 rpm and should be able to rotate in either direction.

OR

A differential band brake has a drum with diameter of 800 mm. The two ends of the band are fixed to the pins on the opposite sides of the fulcrum of the lever at distances of 40 mm and 200 mm from the fulcrum. The angle of contact is 270° and the coefficient of friction is 0.2. Determine the brake torque when a force of 600 N is applied to the lever at a distance of 800 mm from the fulcrum.

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Total No. of Questions :5]

Roll No .....

ME - 505

B.E. V Semester

Examination, June 2015

Dynamics of Machines

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

1. a) Explain piston effort and crank effort.

   b) What is main function of a flywheel?

   c) Write the procedure for determining the turning moment diagram.

   d) A horizontal gas engine running at 210 rpm has a bore of 220 mm and a stroke of 440 mm. The connecting rod is 924 mm long and the reciprocating parts weigh 20 kg. When the crank has turned through an angle of 30° from the inner dead centre, the gas pressure on the cover and the crank sides are 500 kN/m^2 and 60 kN/m^2 respectively. Diameter of the piston rod is 40 mm. determine:

      i) Turning moment on the crank shaft

      ii) Thrust on the bearing

      iii) Acceleration of the flywheel which has a mass of 8 kg and radius of gyration of 600 mm while the power of the engine is 22kW.

OR

The turning moment diagram for a petrol engine is drawn to a vertical scale of 1 mm = 500Nm and a horizontal scale of 1 mm = 3°. The turning moment diagram repeats itself after every half revolution of the crank shaft. The areas above and below the mean torque line are 260, –580, 80, –380, 870 and –250 mm². The rotating parts have a mass of 55 kg and radius of gyration of 2.1 m. If the engine speed is 1600 rpm, determine the coefficient of fluctuation of speed.

2. a) What is the main function of a governor?
   b) Define effort and power of a governor.
   c) Explain the meaning of sensitiveness, hunting, stability and controlling force of a governor.
   d) Each arm of a Porter governor is 250 mm long. The upper and lower arms are pivoted to links of 40 mm and 50 mm respectively from the axis of rotation, each ball has a mass of 5 kg and the sleeve mass is 50 kg. The force of friction on the sleeve of the mechanism is 40 N. Determine the range of speed of the governor for extreme radii of rotation of 125 mm and 150 mm.

OR

In a Hartnell governor, the radius of rotation of the balls is 60 mm at the minimum speed of 240 rpm. The length of the ball arm is 130 mm and the sleeve arm is 80 mm. The mass of each ball is 3 kg and the sleeve is 4 kg. The stiffness of the spring is 20 N/mm. Determine the

i) Speed when the sleeve is lifted by 50 mm
ii) Initial compression of the spring
iii) Governor effort

3. a) What do you mean by static and dynamic balance of machinery?
   b) Define hammer blow, tractive effort and swaying couple.
   c) What do you mean by primary and secondary unbalance in reciprocating engine?
   d) Four masses A, B, C and D carried by a rotating shaft at radii 80 mm, 100 mm, 160 mm and 120 mm respectively are completely balanced. Masses B, C and D are 8 kg, 4 kg, and 3 kg respectively. Determine the mass A and the relative angular positions of the four masses if the planes are spaced 500 mm apart.

OR

Each crank and the connecting rod of a four-crank in line engine are 200 mm and 800 mm respectively. The outer cranks are set at 120° to each other and each has a reciprocating mass of 200 kg. The spacing between adjacent planes of cranks is 400 mm, 600 mm and 500 mm. If the engine is in complete primary balance, determine the reciprocating masses of the inner cranks and their relative angular positions. Also find the secondary unbalanced force if the engine speed is 210 rpm.

4. a) What is friction? Is it necessary evil or blessing?
   b) Explain friction circle.
   c) Explain uniform pressure and uniform wear theories.
   d) In a thrust bearing, the external and internal diameters of the contacting surfaces are 320 mm and 200 mm respectively. The total axial load is 80 kN and the intensity of pressure is 350 kN/m². The shaft rotates at 400 rpm. Taking the coefficient of friction as 0.06, calculate the power lost in overcoming the friction. Also, find the number of collars required for the bearing.