A cone clutch with a semi-cone angle of 15° transmits 10kW at 600rpm. The normal pressure intensity between the surfaces in contact is not to exceed 100kN/m^2. The width of the friction surface is half of the mean diameter. Assuming μ=0.25. Determine the inner and outer diameter of the plate, width of the cone face and axial force to engage the clutch.

a) What is the condition of non-occurrence of jump?
b) What is the creep in a belt drive?
c) Derive the relation for the ratio of the belt tensions in a flat-belt drive.
d) A follower is to move outwards 5cm with simple harmonic motion while the cam turns through 180° with angular velocity ω. The follower is to return with simple harmonic motion during the next 150° rotation and dwell for 30°. Draw the displacement, velocity and acceleration diagram of the follower.

OR

A simple band brake is applied to a rotating drum of diameter 600mm. The lap angle of the band on the drum is 270°. The one end of the lever has the fulcrum pin to which is attached, the one end of the band. Other end of the band is attached to a pin 120mm from the fulcrum. The co-efficient of friction between the band and the drum is 0.25. A braking force of 100N is applied at a distance of 840mm from the fulcrum. Determine the brake torque for counter-clockwise rotation and clockwise rotation of the drum.

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Roll No ....

ME - 505

B.E. V Semester

Examination, June 2016

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 question 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.
v) Assume suitable data or dimensions if necessary.

1. a) Define D' Alembert's principle.
b) Define coefficient of fluctuation of energy.
c) The speed of an engine varies from 210rad/sec to 190 rad/sec. During the cycle the change in kinetic energy is found to be 0.4kJ. Determine the mass moment of inertia of the flywheel.
d) The crank and connecting rod of a vertical petrol engine, running at 1800 rpm are 60mm, 270mm respectively. The diameter of the piston is 100mm and the mass of the reciprocating parts is 1.2kg. During the expansion stroke when the crank has turned 20° from the top dead centre, the gas pressure is 650kN/m^2. Determine the net force on the piston, net load on the gudgeon pin and thrust on the cylinder wall.

OR

A three cylinder single acting engine has its cranks set equally 120° and it runs at 750rpm. The torque-crank angle diagram for each cycle is a triangle for the power stroke with a maximum torques of 100N-m at 60° from the dead centre of the corresponding crank. The torque on the return stroke is sensible zero. Determine; coefficient of fluctuation of speed, if the mass of the flywheel is 15kg and has a radius of gyration of 90mm, power developed, coefficient of fluctuation of energy and maximum angular acceleration of the flywheel.

2. a) Define sensitiveness of Governor.
   b) What is controlling force diagram? Explain its uses.
   c) What do you mean by Isochronous governors?
   d) A porter governor has four arms each 300mm long. The upper and lower arms are pivoted at a radial distance of 35mm and 45mm respectively from the axis of rotation. Each ball has a mass of 4kg and the mass of the sleeve is 40kg. If the friction is equivalent to a load of 35N at the sleeve, what will be the range of speed for extreme radii of the rotation of 150mm and 200mm?

OR

A Hartnell governor has equal balls of mass 3kg, set initially at a radius of 200mm. The arms of the bell-crank lever are 110mm vertically and 150mm horizontally. Determine the initial compressive force on the spring, if the speed for an initial ball radius of 200mm is 240rpm and also find the stiffness of the spring required to permit a sleeve movement of 4mm on a fluctuation of 7.5% in the engine speed.

   a) In case of balancing of several masses in different planes, what are the two conditions to be satisfied in reference plane for the complete balance?

   b) What are the conditions to be satisfied for the complete balance of multi cylinder in-line engine?
   c) Derive the expression for hammer blow.
   d) Four masses A, B, C and D are completely balanced, masses C and D makes angle of 90° and 210° respectively with B in same sense. The planes containing B and C are 0.3m apart. Masses A, B, C and D can be assumed to be concentrated at radial of 0.36m, 0.48m, 0.24m and 0.3m respectively. The masses B, C and D are 15kg, 25kg and 20kg respectively. Determine the mass A and its angular position. Determine the position of planes A and D.

OR

A Radial aero engine has seven cylinders equally spaced with all connecting rods coupled to a common crank. The crank and each of the connecting rod are 0.3m and 1.2m respectively. The reciprocating mass per cylinder is 4kg. Determine the magnitude and angular position of the balance masses required at crank radius for complete primary and secondary balancing of the engine.

4. a) Define the terms coefficient of friction and limiting angle of friction.
   b) What do you mean by film friction? Write its laws.
   c) Explain the terms friction circle, friction couple, and friction axis.
   d) A thrust bearing of a propeller shaft consists of a number of collars. The shaft is of 400mm diameter and rotates at a speed of 90rpm. The thrust on the shaft is 300kN. If the intensity of pressure is to be 200kN/m^2 and coefficient of friction is 0.06, determine external diameter of the collars and the number of collars. The power lost in friction is not exceed 48kW.

OR