An ammonia compressor is driven by a 100-hp synchronous motor that turns 1200 rpm; 12-in. paper motor pulley; 78-in. compressor pulley, cast-iron; C = 84 in. A tension pulley is placed so that the angle of contact on the motor pulley is 193° and on the compressor pulley, 240°. A 12-in medium double leather belt with a cemented joint is used.

a) What will be the tension in the tight side of the belt if the stress is 375 psi?
b) What will be the tension in the slack side?
c) What coefficient of friction is required on each pulley as indicated by the general equation?

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Roll No .....

ME - 505

B.E. V Semester

Examination, December 2014

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) Difference between Machine and Mechanism.
   b) Differentiate between static force analysis and dynamic force analysis.
   c) Why flywheels are needed in forging and pressing operations?
   d) For reciprocating engine, derive the expression for Angular velocity and angular acceleration of the connecting rod.

The length of crank and connecting rod of a horizontal reciprocating engine are 100mm and 500mm respectively. The crank is rotating at 400rpm. When the crank has turned 30° from the IDC, find analytically
i) Velocity of piston
ii) Acceleration of piston
iii) Angular velocity of connecting rod
iv) Angular acceleration of connecting rod.

2. a) What is the function of governor? Differentiate between governors and fly wheel.
   b) How governors are classified?
   c) What is meant by sensitiveness of a governor? Define coefficient of sensitiveness.
   d) Explain the following:
      i) Hunting of governor
      ii) Isochronous conditions governor
      iii) Gyroscopic torque
      iv) Gyroscopic couple

OR

A porter governor has equal arms each 250mm long and pivoted on the axis of rotation. Each ball has a mass of 5kg and mass of the central load on the sleeve is 30kg. The radius of rotation of the ball is 150mm when governor is at maximum speed. Find the maximum and minimum speed and range of speed of the governor.

3. a) What is meant by balancing of rotating masses? Why rotating masses are to be dynamically balanced?
   b) Can a single cylinder engine be fully balanced? Why?
   c) Define static balancing and dynamic balancing. State the conditions for both.
   d) Discuss the following:
      i) Effects of partial balancing of locomotives.
      ii) Why are the cranks of a locomotive, with two cylinders, placed at 90° to each other?
      iii) Effects of partial balancing of locomotives.
      iv) Effects of hammer blow.

OR

The data for three rotating masses are given below:

M1 = 4kg	r1 = 75mm	θ1 = 45
M2 = 3kg	r2 = 85mm	θ2 = 135
M3 = 2.5 kg	r3 = 50mm	θ3 = 240

Determine the amount of counter mass at a radial distance of 65mm required for their static balance.

4. a) Define the friction. State its types.
   b) Compare single plate and multi-plate clutches.
   c) Discuss the concept of friction circle.
   d) A 150mm diameter shaft runs at 1500 rpm, supporting a load of 15 KN. The shaft runs in a bearing of length 1.5 times the shaft diameter The clearing ratio is 0.015. The absolute viscosity of the oil is 11cp. At its operating temperature, find the power lost in friction.

OR

A 400mm diameter shaft is rotating at 220 rpm in a bearing of length 120mm. If the thickness of oil film is 1.5 mm and the dynamic viscosity of the oil is 0.7 Ns/m^2 determine:

i) Torque required overcoming friction in bearing.
ii) Power utilization in overcoming viscous resistance.

5. a) Compare belt, rope and chain drives used for power transmission.
   b) For a given cam, will the choice of the type of follower (knife-edge, flat-faced, roller) affect the displacement diagram?
   c) Discuss maximum power transmitted by belt.
   d) Define the Dynamometer. Discuss its types with applications.

OR