Code No: RT31031 **R13** SET - 1

III B. Tech I Semester Supplementary Examinations, May - 2016
DYNAMICS OF MACHINERY
(Common to ME and AME)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

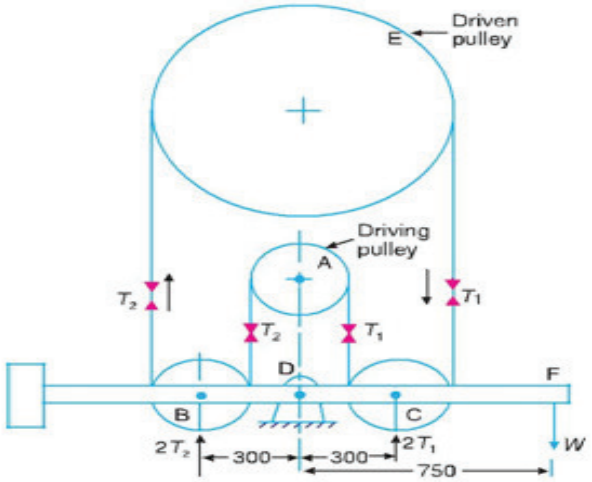
1 a) Explain the gyroscopic effect on four wheeled vehicles. [4M]
b) Explain about film lubrication. [4M]
c) Explain the terms 'fluctuation of energy' and 'fluctuation of speed' as applied to flywheels. [3M]
d) Define and explain "Isochronism" relating to governors. [4M]
e) Write a short note on primary balancing. [4M]
f) What are the causes and effects of vibrations? [3M]

PART -B

2 a) Write a short note on gyroscope. [6M]
b) The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 rpm clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship. [10M]
(**i**) when the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h.
(**ii**) when the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.

3 a) What is meant by the expression 'friction circle'? Deduce an expression for the radius of friction circle in terms of the radius of the journal and the angle of friction. [8M]

b) The essential features of a transmission dynamometer are shown in Fig.1. A is the driving pulley which runs at 600 r.p.m. B and C are jockey pulleys mounted on a horizontal beam pivoted at D, about which point the complete beam is balanced when at rest. E is the driven pulley and all portions of the belt between the pulleys are vertical. A, B and C are each 300 mm diameter and the thickness and weight of the belt are neglected. The length DF is 750 mm. Find i) the value of the weight W to maintain the beam in a horizontal position when 4.5 kW is being transmitted and ii) the value of W, when the belt just begins to slip on pulley A. The coefficient of friction being 0.2 and maximum tension in the belt 1.5 kN. [8M]



All dimensions are in mm

Fig.1

4 a) Discuss the method of finding the crank effort in a reciprocating single acting, single cylinder petrol engine. [8M]

b) The connecting rod of a gasoline engine is 300 mm long between its centres. It has a mass of 15 kg and mass moment of inertia of 7000 kg-mm^2. Its centre of gravity is at 200 mm from its small end centre. Determine the dynamical equivalent two-mass system of the connecting rod if one of the masses is located at the small end centre. [8M]

5 a) State the different types of governors. Explain about any one of them. [8M]

b) The following particulars refer to a Wilson-Hartnell governor: [8M]
Mass of each ball = 2 kg ; minimum radius = 125 mm ; maximum radius = 175 mm ; minimum speed = 240 rpm ; maximum speed = 250 rpm ; length of the ball arm of each bell crank lever = 150 mm; length of the sleeve arm of each bell crank lever = 100 mm ; combined stiffness of the two ball springs = 0.2 kN/m. Find the equivalent stiffness of the auxiliary spring referred to the sleeve.

6 a) Discuss how a single revolving mass is balanced by two masses revolving in different planes. [7M]

b) The following data refer to two cylinder locomotive with cranks at 90°: [9M]
Reciprocating mass per cylinder = 300 kg ; Crank radius = 0.3 m ; Driving wheel diameter = 1.8 m ; Distance between cylinder centre lines = 0.65 m ; Distance between the driving wheel central planes = 1.55 m.
Determine i) the fraction of the reciprocating masses to be balanced, if the hammer blow is not to exceed 46 kN at 96.5 kmph,
ii) the variation in tractive effort and
iii) the maximum swaying couple.

7 a) Discuss briefly with neat sketches the longitudinal, transverse and torsional free vibrations. [8M]

b) A shaft, 1.5 m long, supported by flexible bearings at the ends carries two wheels each of 50 kg mass. One wheel is situated at the centre of the shaft and the other at a distance of 375 mm from the centre towards left. The shaft is hollow of external diameter 75 mm and internal diameter 40 mm. The density of the shaft material is 7700 kg/m^3 and its modulus of elasticity is 200 GN/m^2. Find the lowest whirling speed of the shaft, taking into account the mass of the shaft. [8M]

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