CODE NO: OR310354 OR

2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS
DYNAMIC MECHANICS
(MECHANICAL ENGINEERING AND PRODUCTION ENGINEERING)

APRIL/MAY 2005

TIME – 3 HOUR
MARK – 80

Answer any FIVE Questions
All Questions carry equal marks

1. In the figure 1 given below the slider crank mechanism, the forces Fl and F2 are known. Determine the torque that may be applied on the crank shaft to maintain equilibrium. Fl = 100kgf, F2 = 80 kgf, Ab = 36 cm, OA=9cm,AS = 16cm 6 AOB =450.

2. (a) What is Turning Movement diagram? Mention its uses.

(b) A certain machine requires a torque of (1500+200 sin)N-m to drive it where is the angle of rotation of shaft. The machine is directly connected to an engine which produces a torque (1500+250 sin)N-m. The flywheel and other rotating parts have a mass 300 kg at radius of gyration 200mm. Mean speed is 200 rpm. Find:

i. Kinetic Energy of flywheel

ii. Percentage coefficient of fluctuation of speed

iii. Crank angle at Maximum Turning Moment.

3. (a) Derive expression for total braking torque about fulcrum in differential band brake, when brake drum rotating in counter-clockwise direction.

(b) Distinguish between brakes and Dynamometers.

(c) Explain function of absorption type dynamometer.

4. (a) The mean diameter of a Whitworth bolt having V -threads is 30 mm. The pitch of the thread is 6 mm and the angle of V is 550. The bolt is tightened by screwing a nut, whose mean radius of the bearing surface is 30 mm. If µ between nut and bolt is 0.1 and between nut and bearing surfaces is 0.16: Find the force required at the end of a spanner 0.5 m long when the load on the bolt is 10 kN.

(b) Two tie rods are connected by a buckle having right and left handed threads. The threads are V -type and have a pitch of 5 mm on a mean diameter of 30 mm and a thread angle of 600. Assuming coefficient of friction as 0.15, find the torque required to produce a pull of 4 × 104N.

5. (a) Derive an expression for the height of Pro ell governor.

(b) Calculate the minimum speed of a Proell governor, which has equal arms each 200mm and are pivoted on the axis of rotation. The mass of each ball is 4kg and the central mass on the sleeve is 20kg. The extension arms of the lower links are each 60mm long and parallel to the

axis when the minimum radius
of the ball is 100mm.

6. The reciprocating masses of the three cylinder engine are 4.1, 6.2 and 7.4 tonnes respectively. The centre lines of the three cylinders are 5.2m; 3.2m and 1.2m from the fourth cylinder. If the cranks for all the cylinders are equal, determine the reciprocating mass of the fourth cylinder and the angular position of the cranks such that the system is completely balanced for the primary force and couple. If the cranks are 0.8m long, the conecting roads3.8m and the speed of engine 75 r.p.m, find the maximum unbalanced secondary force and the crank angle at which it occurs.

7. (a) Distinguish reverse and direct crank methods of balancing of radial engines.

(b) Distinguish balancing of inline engines and radial engines with appropriate examples

8. (a) Derive an equation for the transverse vibration of a uniformly loaded shaft.

(b) A rigid massless bar of length L is hinged at its end and carries a spring K2 with mass at its right end. The bar is also supported by a spring K1 at a distance from the left hinge. Determine the natural frequency of the bar.