JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, March - 2021
DYNAMICS OF MACHINERY
(Common to ME, MCT)

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks
- - -

1. A four bar mechanism with the following dimensions is acted upon by a force 80 at 150^0 N on the link DC as shown in Figure 1.
    AD= 500 mm, AB = 400 mm, BC = 1000 mm, DC = 750 mm, DE = 350 mm.
    Determine the input torque T on the link AB for the static equilibrium of the mechanism for the given configuration. [15]
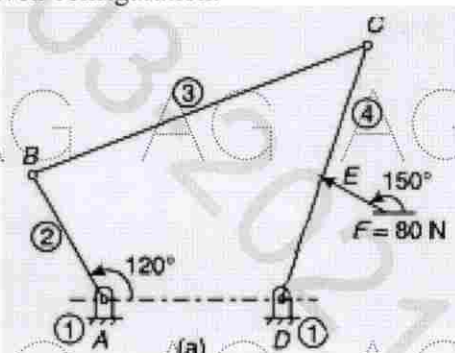

Figure 1

2. Discuss with neat sketches the stability of a two wheel vehicle taking a turn. [15]

3. The crank-pin circle radius of a horizontal engine is 300 mm. The mass of the reciprocating parts is 250 kg. When the crank has travelled 60^0 from I.D.C., the difference between the driving and the back pressures is 0.35 N/mm². The connecting rod length between centers is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 r.p.m. and if the effect of piston rod diameter is neglected, calculate: a) Pressure on slide bars, b) Thrust in the connecting rod, c) Tangential force on the crank-pin, and d) Turning moment on the crank shaft. [15]

4. What are uniform pressure and uniform wear theories? Deduce expressions for the friction torque considering both the theories for a flat collar. [15]

5. A simple band brake is operated by a lever of length 500 mm. The brake drum has a diameter of 500 mm and the brake band embraces 5/8 of the circumference. One end of the band is attached to the fulcrum of the lever while the other end is attached to a pin on the lever 100 mm from the fulcrum. If the effort applied to the end of the lever is 2 kN and the coefficient of friction is 0.25, find the maximum braking torque on the drum. [15]

6. A Hartnell governor has two rotating balls, of mass 2.7 kg each. The ball radius is 125 mm in the mean position when the ball arms are vertical and the speed is 150 r.p.m. with the sleeve rising. The length of the ball arms is 140 mm and the length of the sleeve arms 90 mm. The stiffness of the spring is 7 kN/m and the total sleeve movement is 12 mm from the mean position. Allowing for a constant friction force of 14 N acting at the sleeve, determine the speed range of the governor in the lowest and highest sleeve positions. Neglect the obliquity of the ball arms. [15]

7. Explain the following:
a) Hammer blow
b) Swaying couple
c) Variation of tractive effort. [5+5+5]

8.a) Explain briefly the critical speed of shaft.
b) Determine the natural frequency of a vibratory system shown in Figure 2. (Neglect the weight of the pulley). [7+8]
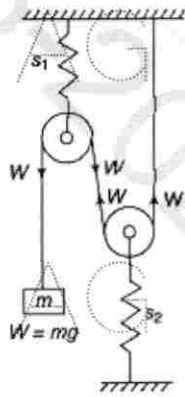

Figure 2

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