II B. TECH II SEMESTER REGULAR EXAMINATIONS, JUNE - 2022
DYNAMICS OF MACHINERY
(MECHANICAL ENGINEERING)
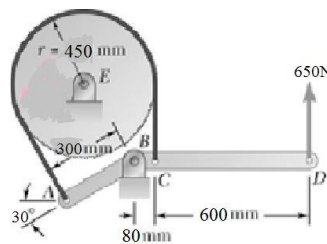
Time: 3 hours   Max. Marks: 70

Note: Answer **ONE** question from each unit **(5 × 14 = 70 Marks)**
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UNIT-I

1. a) Derive expression for frictional torque in collar bearing using uniform pressure condition [7M]

    b) A conical pivot bearing supports a vertical shaft of 200 mm diameter. It is subjected to a load of 30kN. The angle of cone is 120 degrees and the coefficient of friction is 0.025. Find the power lost in friction when the speed is 140 rpm, assuming uniform pressure. [7M]

(OR)

2. a) Explain terms1 self locking 2 self energizing of brakes. [4M]

    b) In the deferential band brake, as shown in figure below, the diameter of the drum is 900 mm, and the coefficient of friction between the drum and the band is 0.3. The angle of contact is 240⁰. When a force of 650N is applied at the free end of the lever, find the maximum and the minimum force in the band, and the torque which can be applied by the brake? [10M]

UNIT-II

3. a) Define the terms coefficient of fluctuation of energy and coefficient of fluctuation of speed. [4M]

    b) The crank effort diagram for a four stroke cycle gas engine may be assumed simplicity to consist of four triangles, the areas of which, from the line of zero pressure, are: power stroke, 60 sq cm; exhaust stroke, 5 sq cm; suction stroke 3 sq cm; compression stroke 15 sq cm; each square cm represents 1kN-m. Assuming the resistance to be uniform, find: i. The power of the Engine ii. The energy to be stored by the flywheel. [10M]

(OR)

4. a) Draw the turning moment diagram for four stroke IC Engine. [7M]

    b) Write short notes on the following:
        (a) Turning moment diagram (b) Piston effort [7M]

UNIT-III

5. a) Explain the effect of gyroscopic couple on naval ship. [4M]

b) A Porter governor carries a central load of 30 kgf and each ball weighs 4.5 kgf. The upper links are 20 cm long and the lower links are 30 cm long. The points of suspension of upper and lower links are 5 cm from axis of spindle. Calculate: (a) The speed of the governor in rpm if the radius of revolution of the governor ball is 12.5 cm and (b) The effort of the governor for increase of speed of 1%. [10M]

(OR)

6. a) Explain the effect of gyroscopic couple on aero plane. [4M]

b) An aero-plane makes a complete half circle of 50 m radius towards left in a time of 20 seconds when flying at 200kmph. The rotary engine and the propeller of the plane has a mass of 400kg and a radius of gyration of 0.3 m. The engine rotor rotates at 2400 rpm clockwise when seen from the rear. Find the gyroscopic couple on the air craft and state its effect on the aero-plane. [10M]

UNIT-IV

7. a) Discuss about primary and secondary balancing in reciprocating engines. [4M]

b) Four masses m_1, m_2, m_3 and m_4 having 100, 175, 200 and 25 kg are fixed to cranks of 20 cm radius and revolve in places 1, 2, 3 and 4. The angular position of the cranks in planes 2, 3 and 4 with respect to the crank in plane 1 are 75^0, 135^0 and 200^0 taken in the same sense. The distance of planes 2, 3 and 4 from plane 1 are 60 cm, 186 cm and 240 cm respectively. Determine the position and magnitude of the balance mass at a radius of 60 cm in plane L and M located at middle of the plane 1 and 2 and the middle of the planes 3 and 4 respectively. [10M]

(OR)

8. a) A shaft 3 m span between the bearings carries two masses of 5 kg and 10 kg acting at the extremities of the arms 0.45 m and 0.6 m long respectively. The planes in which the masses rotate are 1.2 m and 2.4 m respectively from the left hand bearing and the angle between the arms is 60^0. If the speed of rotation is 100 rpm. Find the displacing force on the two bearings of the machine. If the masses are balanced by two additional rotating masses acting at a radius 0.3 and placed 0.3 m from each bearing, Estimate the magnitude of the two balanced masses and the angles at which they may be set with respect to the two arms. [7M]

b) Explain about i). Tractive force ii). Swaying couple iii). Hammer blow [7M]

UNIT-V

9. a) Determine natural frequency of the pendulum system. [7M]

b) Define: i. Free vibrations ii. Forced vibrations iii. Damping. [7M]

(OR)

10. a) Distinguish between longitudinal, transverse and torsional vibrations. [7M]

b) A cantilever shaft of 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus of the shaft material is 200 GN / m^2. Determine the frequency of longitudinal and transverse vibrations of the shaft. [7M]

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