Fifth Semester B.E. Degree Examination, Jan./Feb. 2023
Dynamics of Machines

Time: 3 hrs.   Max. Marks:80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 In the Fig.Q1 a four bar mechanism is shown. Calculate the required value of T_2 and various forces in links for the equilibrium of the system.
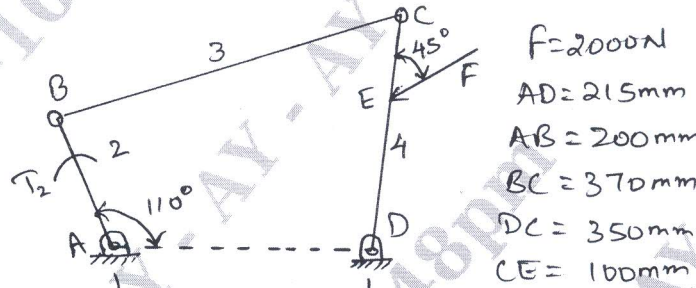

F = 2000N
AD = 215mm
AB = 200mm
BC = 370mm
DC = 350mm
CE = 100mm

Fig.Q1   **(16 Marks)**

OR

2 a. Explain D'Alembert's principle.   **(06 Marks)**

   b. When the crank is 45° from the inner dead center on the down stroke. The effective steam pressure on the piston of a vertical steam engine is 2.5 bar. The diameter of the cylinder = 0.75m, stroke of the piston = 0.50m and length of the connecting rod = 1m. Determine the torque on the crank shaft, if the engine runs at 350rpm, and the mass of reciprocating parts is 200kg.   **(10 Marks)**

Module-2

3 A, B, C and D are 4 masses carried by a rotating shaft at radius 100, 125, 200 and 150mm respectively. The planes in which the masses revolve are spaced 600mm apart and the masses B, C and D are 10, 5, 4 kg respectively. Find the required mass A and the relative angular positions of the four masses to keep the shaft in balance.   **(16 Marks)**

OR

4 a. With neat sketch explain primary and secondary unbalanced forces reciprocating masses.
                                                                            (08 Marks)

   b. Prove that the resultant unbalanced force is minimum when half of the reciprocating masses are balanced by rotating masses i.e. when $C = \dfrac{\ell}{2}$.   **(08 Marks)**

Module-3

5 a. Discuss the relation between E, e_{max} and K_s. (06 Marks)

    b. The TMD for a four stroke gas engine may be assumed for simplicity to be represented by 4 triangles, the areas of which from the line of zero pressure are as follows : Expansion = $35.5cm^2$, Suction = $3.5cm^2$, exhaust = $5cm^2$, compression = $14cm^2$. Each sq.cm. represents 295Nm of work, assuming the resisting moment to be uniform, find the mass of the rim of the flywheel required to keep the mean speed 200rpm within ± 2% of the mean speed. Radius of the rim may be taken as 75cm. (10 Marks)

OR

6 a. Define the following :
      i) Sensitiveness
      ii) Hunting
      iii) Stability. (06 Marks)

    b. Derive an expression for speed and height of the porter governor. (10 Marks)

Module-4

7 a. Discuss the laws of solid friction. (06 Marks)

    b. Derive an expression for total frictional torque for flat collar bearing considering :
      i) Uniform pressure
      ii) Uniform wear. (10 Marks)

OR

8 a. Derive an expression for length of open belt drive. (10 Marks)

    b. Derive an expression for the effect of centrifugal tension. (06 Marks)

Module-5

9 a. Derive the expression for stability of a two – wheel vehicle. (08 Marks)

    b. Analyse the stability of a two wheel vehicle taking left turn. Derive the necessary equations. (08 Marks)

OR

10   Derive an expression for displacement, velocity and acceleration of follower when the roller is in contact with straight flank. (16 Marks)

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