CBCS SCHEME

USN | | | | | | | | | | |

17AU52

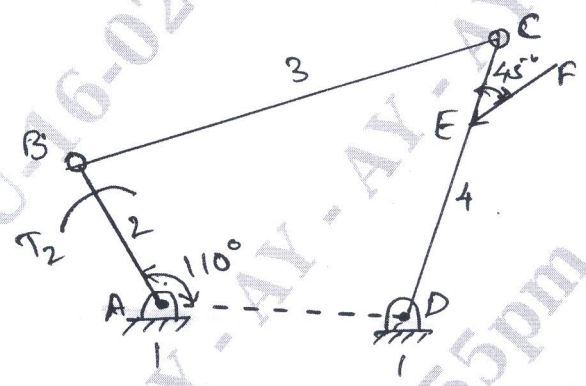
Fifth Semester B.E. Degree Examination, Jan./Feb. 2023
Dynamics of Machines

Time: 3 hrs. Max. Marks: 100

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 on links for the equilibrium of the system.



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

Fig Q1

(20 Marks)

OR

2 a. Explain D'Alembert's principle. **(08 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 bars. 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 cranks shaft, if the engine runs at 350rpm, and the mass of reciprocating parts is 200kg. **(12 Marks)**

Module-2

3 a. With a neat sketch, explain primary and secondary unbalanced forces of 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 = $\ell/2$. **(12 Marks)**

OR

4 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, 4Kg respectively. Find the required mass A and the relative angular positions of the four masses to keep the shaft in balance. **(20 Marks)**

Module-3

5 a. Discuss the relation between E, e_{max} and K_s. (10 Marks)

b. The TMD for a four stroke gas engine may assumed for simplicity to be represented by Four 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 rim of the flywheel required to keep the mean speed 200rpm within $\pm 2\%$ 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
iv) Governor power. (12 Marks)

b. Derive an expression for speed and height of the Porter Governor. (08 Marks)

Module-4

7 a. Derive an expression for length of open belt drive. (12 Marks)

b. Derive an expression for the effect of centrifugal tension. (08 Marks)

OR

8 a. Discuss the laws of solid friction. (08 Marks)

b. Derive an expression for total frictional torque for flat collar bearing considering
i) Uniform pressure
ii) Uniform wear. (12 Marks)

Module-5

9 a. With a neat sketch gyroscopic couple and also derive the expression for gyroscopic couple. (10 Marks)

b. Derive the expression for stability of a two wheel vehicle. (10 Marks)

OR

10 Derive an expression for displacement velocity and acceleration of follower when the roller is in contact with straight flank. (20 Marks)

* * * * *