CBCS SCHEME

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18AU52

Fifth Semester B.E. Degree Examination, June/July 2025
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 a. Discuss static equilibrium of i) Two force ii) Three force iii) Two force and torque member. **(06 Marks)**

b. A slider crank mechanism is shown in Fig. Q1(b). The force applied to the piston is 1000N when the crank is at 120° from IDC. Determine the input torque. T on the link OA for the static equilibrium of the mechanism for the given configuration. **(14 Marks)**

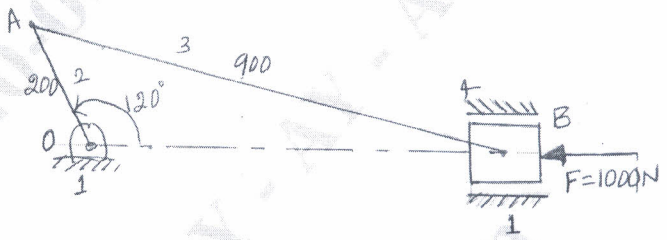

Fig. Q1(b)

OR

2 a. State and explain D' Alembert principle. **(08 Marks)**

b. In a vertical double acting engine, the connecting rod is 4.5 times the crack. Stroke of the piston is 400 mm and the mass of the reciprocating parts is 100 kg. The engine runs at 250 rpm. If the net load on the piston due to steam pressure is 25KN when the crank has turned through an angle of 120° from the top dead centre. Determine

i) Net force on the piston or piston effort.
ii) Thrust in the connecting rod or force acting along the connecting rod.
iii) Thrust on the sides of cylinder walls or pressure on slide bars.
iv) Crank pin effort or tangential force on the crank pin.
v) Thrust on crank shaft bearing.
vi) Turning moment or troque on the crank shaft. **(12 Marks)**

Module-2

3 a. Explain static and dynamic balancing. **(04 Marks)**

b. A. B. C and D are 4 masses carried by a rotating shaft at radius 100 , 125 , 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm 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 4 masses to keep the shaft in balance. **(16 Marks)**

OR

4 In a four cylinder engine the two outer cranks are at 120° to each other and their reciprocating masses are each 100 kg. The distance between the planes of rotation of adjacent cranks are 450 mm, 750 mm and 450 mm. Length of each crank is 300 mm and length of each connecting rod is 1200 mm speed of engine is 240 rpm. Find

i) The reciprocating masses and relative angular positions for each of the inner cranks.
ii) The unbalanced secondary forces and couples if any, measured about the central plane for this arrangement arrived at for primary balancing. **(20 Marks)**

Module-3

5 a. Obtain an expression for the hoop stress developed in the rim of a flywheel. **(10 Marks)**

b. A double acting steam engine develops 350 KW at 120 rpm. It is fitted with a flywheel of radius of gyration = 2.5m. The co-efficient of fluctuation of energy = 0.1. The speed of flywheel is not to deviate more than 0.5% from the mean speed. Find the mass of fly wheel. **(10 Marks)**

OR

6 a. Derive an expression for power of porter governor. **(10 Marks)**

b. The mass of each ball of a spring controlled governor is 1.4 kg. The ball crank level has its vertical arm 90 mm and horizontal arm 40 mm. The distance of fulcrum from the axis of rotation is 45 mm. The sleeve has a mass of 7.5kg. The sleeve begins to rise at 220 rpm. The rise of the sleeve for 6% rise in speed is 8 mm. Find the initial thrust on the spring and its stiffness. **(10 Marks)**

Module-4

7 a. Derive an expression for total frictional torque of flat collar bearing considering uniform pressure and uniform wear. **(10 Marks)**

b. Derive an expression for total friction torque in conical pivot bearing considering uniform pressure and uniform wear. **(10 Marks)**

OR

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

b. Derive an expression for ratio of tension in flat belt. **(10 Marks)**

Module-5

9 Discuss all 8 cases of gyroscopic effect on Aeroplane. **(20 Marks)**

OR

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

b. Derive an expression for displacement, velocity and acceleration, when the flat face of the follower has contact on the circular flank. **(10 Marks)**

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