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17AU52

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
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 Two – force member and Three – force member. **(08 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 60^0 from IDC. Calculate the driving torque T_2.
AB = 100mm , BC = 300mm. **(12 Marks)**

Fig.Q1(b)
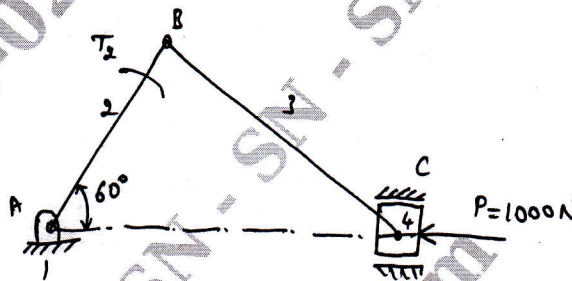
OR

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

　b. Explain Inertia forces on a four – bar mechanism. **(12 Marks)**

Module-2

3　a. Why is balancing of Rotating masses done? **(06 Marks)**

　b. A shaft 3m span between bearings carries two masses 5kg and 10kg acting at the extrimities of the arms of length 0.45m and 0.6m respectively. The planes in which the masses rotate are 1.2m and 2.4m respectively from the left bearing and the angle between their arms is 60^0. If these two masses are to be balanced by two additional rotating masses acting at radius of 0.3m and rotating in planes 0.3m to the right of the left bearing and 0.3m to the left of the right bearing respectively. Determine the magnitude of the two masses and the angle at which they may be set. **(14 Marks)**

OR

4　a. Derive expression for unbalanced force in case of reciprocating masses. **(10 Marks)**

　b. The pistons of a 4 cylinder vertical inline engine reach their uppermost position at 90^0 interval in order of their axial position. Pitch of cylinder = 0.35m. Crank radius = 0.12m, length of C.R = 0.42m. The engine runs at 600 rpm. If the reciprocating parts of each engine has a mass of 2.5kg, find the unbalanced primary and secondary forces and couples. Take central plane of engine as reference plane. **(10 Marks)**

Module-3

5　a. Compare between Functions of Flywheel and Governor. **(10 Marks)**

　b. Classify Governor's and explain working principle of a Simple Centrifugal Governor. **(10 Marks)**

OR

6 a. Define : i) Sensitiveness   ii) Hunting   iii) Stability   iv) Isochronous Governor.
(08 Marks)

   b. A Porter governor has all four arms – 300mm long, the upper arms are pivoted on the axis of rotation and lower arms are attached to the sleeve at a distance 35mm from axis. The mass of each ball is 7kg and the load on the sleeve is 540N. Determine the equilibrium speed for the two extreme radii of 200mm and 260mm of rotation of governor balls.   **(12 Marks)**

Module-4

7 a. Derive an expression for total frictional torque in Conical Pivot Bearing considering uniform pressure and Uniform wear.   **(10 Marks)**

   b. The thrust of a propeller shaft in a marine engine is taken up by a number of collars integrated with the shaft which is 300mm in diameter. The thrust on the shaft is 200KN and the speed is 75 rpm. Taking μ constant and equal to 0.05 and assuming intensity of pressure equal to 0.3N/mm². Find the external diameter of collar and the number of collars required. If the power lost in friction is not to exceed 16KW.   **(10 Marks)**

OR

8 a. Derive an expression for ratio of belt tension.   **(10 Marks)**

   b. Two pulley one 450mm diameter and other 200mm diameter are on parallel shaft 1.95m apart and are connected by cross belt. Find the length of the belt, angle of contact between belt and pulley. What power can be transmitted by the belt when larger pulley rotates at 200 rpm? If the maximum permissible tension in the belt is 1KN and coefficient of friction is 0.25.   **(10 Marks)**

Module-5

9 With neat figures, explain Gyroscopic effect on Aeroplane.   **(20 Marks)**

OR

10 a. Analyse the stability of a two wheel vehicle taking Right turn. Derive the necessary equations.   **(10 Marks)**

   b. For a symmetrical tangent cam operating a roller follower, the least radius of cam is 30mm and roller radius is 15mm. The angle of ascent is 60⁰, the total lift is 15mm and the speed of the cam shaft is 300 rpm. Calculate principal dimensions of cam.   **(10 Marks)**

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