CBCS SCHEME

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18AU52

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
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. Explain the analysis of engine mechanism with suitable figure. **(06 Marks)**

b. Determine the various forces on the links and couple T_2 as shown in Fig.Q1(b).

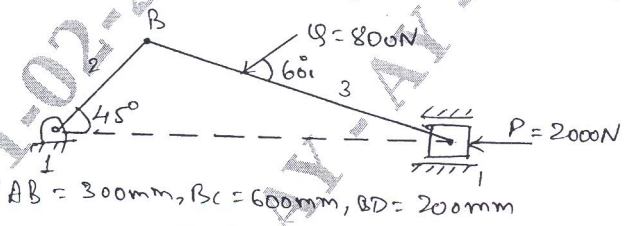

Fig.Q1(b) **(14 Marks)**

OR

2 The four bar mechanism is shown in Fig.Q2. The centre of gravity of each link is at its mid point. Length of links : O_2O_4 = 500mm, O_2A = 250mm, O_4B = 300mm, AB = 300mm. Mass of the links O_2A = 1.52kg, AB = 3.06kg, O_2B = 5.09kg.
Mass moment of inertia of links : O_2A = 0.012kgm^2, AB = 0.036kgm^2, O_4B = 0.02kgm^2. Find the inertia forces on each link.

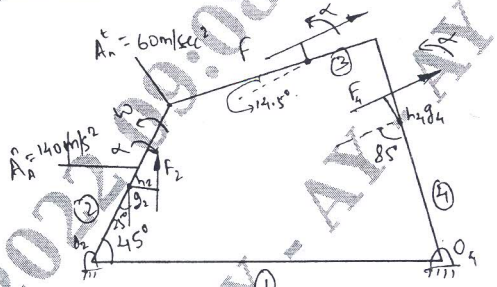

Fig.Q2 **(20 Marks)**

Module-2

3 a. A, B, C and D are 4 massed 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 4 masses to keep the shaft in balance. **(14 Marks)**

b. Describe the static and dynamic balancing. **(06 Marks)**

OR

4 A 5 cylinder inline engine running at 500 rpm has successive cranks at 144° apart. The distance between the cylinder center line is 300mm. Piston stroke = 240mm, Length of CR = 480mm. Examine the engine for balance of primary and secondary forces and couples. Find the maximum value of these and position of central crank at which these maximum values over. The reciprocating mass for each cylinder position of central crank at which these maximum values occur. The reciprocating mass for each cylinder is 150N. **(20 Marks)**

Module-3

5 a. The TMD for a four stroke gas engine may be assumed for simplicity to be represented by 4 triangles and areas of which from the line of zero pressure are as follows :
Expansion = 35.5cm^2, section = 3.5cm^2, Exhaust = 5cm^2, Compression = 14cm^2, 1cm^2 = 295 Nm. 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 = 75cm. **(14 Marks)**

b. Explain the relationship between e_{max}, K_S and ℓ. **(06 Marks)**

OR

6 a. Derive an expression for speed and height of the porter governor by instantaneous method. **(10 Marks)**

b. The radius of rotation of the balls of a Hartwell governor is 8cm at the minimum speed of 300rpm. Neglecting gravity effect determine the speed after the sleeve is lifted by 6cm, also determine the initial compression of the spring, governor effort and power. The particulars of the governor are length of ball arm = 15cm, length of sleeve arm = 10cm, mass of each ball = 4kg and stiffness = 25000N/m. **(10 Marks)**

Module-4

7 a. Describe the laws of solid friction. **(07 Marks)**

b. Derive an expression for total frictional torque of flat collar bearing considering uniform pressure and uniform wear. **(13 Marks)**

OR

8 a. Drive an expression for effect of centrifugal tension. **(10 Marks)**

b. Derive an expression for ratio of belt tensions. **(10 Marks)**

Module-5

9 a. Derive an expression for stability of a two wheel vehicle. **(12 Marks)**

b. Describe Gyroscopic couple with suitable figure and expression. **(08 Marks)**

OR

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

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