CBCS SCHEME

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17AU52

Fifth Semester B.E. Degree Examination, June/July 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 a. Explain briefly with neat figure equilibrium of two, three and four forces. **(10 Marks)**

b. A slide crank mechanism as shown in Fig Q1(b). The force applied to the piston is 1000N when the crank is at 60° from IDC. Calculate the driving torque T_2.

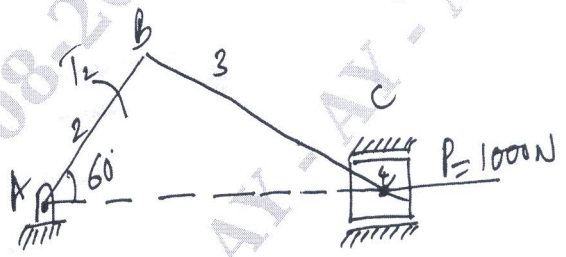

Fig Q1(b) **(10 Marks)**

OR

2 A certain machine requires a torque of 5000 + 500 sin θ Nm to drive it, when θ is the angle of rotation of shaft. The machine is directly coupled to an engine which produce to torque of (500 + 600 sin 2θ) Nm. The flywheel and the other rotating parts has a mass of 500Kg, radius of gyration 0.4m and mean speed 150rpm, determine :

i) Fluctuation of energy
ii) Percentage fluctuation of speed
iii) Maximum and minimum angular acceleration of flywheel and the corresponding angular position. **(20 Marks)**

Module-2

3 A shaft carries four masses A, B, C and D placed is parallel planes perpendicular to the shaft axis and in this order along the shaft. The masses B and C are 40Kg and 28Kg and both are at 160mm radius. While the mass is planes A and D are 200mm radius. Angle between B and C is 100° : B and A is 190°, both angles being measured in the same sense. Planes A and B are 250mm apart, B and C are 500mm apart. If the shaft is to be in complete balance, determine : i) masses in plane A and D ii) Distance between 1 lanes C and D iii) Angular position of mass D. **(20 Marks)**

OR

4 The pistons of a cylinder vertical in line engine reach their upper most position at 90° 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 has a mass of 2.5kg, find the unbalanced primary and secondary forces and couples. Take central plane of engine as reference plane. (solve by Analytical is graphical method) **(20 Marks)**

Module-3

5 In a porter governor the upper and lower arms are each 200mm long and hinged on the main axis. Each ball weight 25N and the weight of the sleeve in 250N. The force friction on the sleeve is 25N. The inclination of the arm to the vertical is 30° and 45° is the lowest and highest position. Calculate :

i) Travel of sleeve
ii) Speed at the bottom middle and top, taking friction into account during upward travel
iii) Speed at the bottom, middle and top, during downward travel considering friction
iv) Speed at the bottom, middle and top of the travel neglecting friction. **(20 Marks)**

OR

6 A spring loaded governor of the Hartwell type has arms of equal length. The masses rotate in a circle of 130mm diameter when the sleeve is in mid position and the ball arms an vertical. The equilibrium speed for this position is 450rpm neglecting friction. The maximum sleeve moment to be 25mm and the maximum position of speed taking friction into account is to be 15% of the mid position speed. The mass of the sleeve in 4Kg and the friction may be considered equivalent to 30 N at the sleeve. The power of the governor must be sufficient to overcome the friction by the percentage change of speed way at mid position. Neglecting obliquity of arm, determine :

i) The valve of each rotating mass
ii) The spring stiffness
iii) The initial compression to spring. **(20 Marks)**

Module-4

7 A shaft rotating at 300rpm transmitting 5kW power to drive another shaft at 500rpm through a belt. The belt is 120mm wide and 15mm thick. The distance between the centers of the shaft is 3m. The effective diameter of smaller pulley is 0.75m. Calculate the stream in the belt, if it is i) An open belt drive ii) A cross belt drive .
Take coefficient of friction between the belt and pulley as 0.3. **(20 Marks)**

OR

8 Power is transmitted by an open belt drive from a pulley 0.3 diameter running at 600rpm to a pulley 0.5m diameter angle of lap on smaller pulley = 160°. The belt is on the point of slipping when 2kW is being transmitted, coefficient of friction is 0.25. If is desired to increase the power to be transmitted. State which of the following method suggested would be more effective.

i) Increase in initial tension in the belt by 10%
ii) Increase in coefficient of friction by 10% with the application of suitable driving to the belt.
iii) Also calculate the percentage increase in power in each case. **(20 Marks)**

Module-5

9 Explain briefly gyroscopic effect on slip and explain i) steering ii) pitching iii) Rolling. **(20 Marks)**

OR

10 Explain briefly stability of four wheel drive (automobile moving is curved path) **(20 Marks)**

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