CBCS SCHEME

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15AU52

Fifth Semester B.E. Degree Examination, June/July 2023
Dynamics of Machines

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. What is Point of Concurrency? Explain equilibrium with respect to four force member. **(06 Marks)**

b. For the mechanism shown in Fig.Q1(b), find the required input torque for the static equilibrium. The lengths OA and AB are 250 mm and 650 mm respectively and force is 500 N. **(10 Marks)**

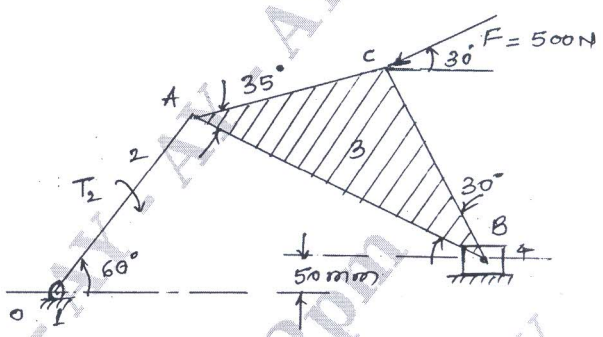

Fig. Q1(b)

OR

2 a. Explain the following terms with respect to I.C. engine:
i) Piston effort ii) Crank effort. **(04 Marks)**

b. The crank and connecting rod of a vertical single cylinder gas engine running at 1800 rpm are 60 mm and 240 mm respectively. The diameter of the piston is 80 mm and the mass of the reciprocating parts is 1.2 kg. At a point during the power stroke, when the piston has moved 20 mm from the top dead centre position, the pressure on the piston is 800 kN/m^2. Determine : i) Net force on the piston, ii) Thrust in the connecting rod, iii) Thrust on the sides of cylinder walls, iv) Engine speed at which the above values are zero. **(12 Marks)**

Module-2

3 a. Define Static and Dynamic Balancing. **(04 Marks)**

b. Four masses A, B, C and D revolve at equal radii and are equally spaced along the shaft. The mass B is 6kg and the radii of C and D make 90° and 240° with respect to B. Find the magnitude of masses and angular position of A so that the system may completely be balanced.. **(12 Marks)**

OR

4 The Pistons of 4 – cylinder vertical in line engine reach their uppermost position at 90° interval in the order of their axial position. Pitch of cylinder = 0.35m , Crank radius = 0.12m , Length of connecting rod = 0.42m. The engine runs at 600rpm. 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. **(16 Marks)**

Module-3

5 Turning moment curve for one revolution of a multi-cylinder engine above and below line of mean resisting torque are given by –0.32, +4.06, –2.71, +3.29, –3.16, +2.32, –3.74, +2.71 and –2.45 sq.cm. The vertical and horizontal scales are 1 cm = 60000 kg/cm and 1 cm = 24° respectively. The fluctuation of speed is limited to ±1.5% of mean speed which is 250 rpm. The hoop stress in rim material is limited to 56 kg/cm^2. Neglecting effect of boss and arms determine suitable diameter and cross section of flywheel rim. Density of rim material is 0.0072 kg/cm^3. Assume width of rim equal to 4 times its thickness. **(16 Marks)**

OR

6 a. Explain following : i) Sensitiveness ii) Stability of governor. **(04 Marks)**

b. In an engine governor of the porter type, the upper and lower arms are 200 mm and 250 mm respectively and are pivoted on the axis of rotation. The mass of sleeve is 15 kg, the mass of each ball is 2 kg and friction of the sleeve together with the resistance of operating gear is equal to a load of 25 N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40°, find taking friction into account, range of speed on the governor. **(12 Marks)**

Module-4

7 a. Explain the following : i) Pivot bearing, ii) Collar bearing. **(06 Marks)**

b. In a thrust bearing, the external and internal diameter of the contact surfaces are 300 mm and 200 mm respectively. The total axial load is 100 kN and the intensity of pressure is 250 kN/m^2. The speed of the shaft is 500 rpm and coefficient of friction is 0.05. Assume uniform pressure theory. Calculate : i) Number of collars required, ii) Power lost due to friction. **(10 Marks)**

OR

8 a. Write a short note on Power Transmission chains. **(06 Marks)**

b. A belt drive is required to transmit 10 KW from a motor running at 600 rpm. The belt is 12 mm thick and has a mass density of 0.001 grams/mm^3. Safe stress in the belt is not to exceed 2.5 N/mm^2. Diameter of the driving pulley is 250 mm, whereas the speed of the driven pulley is 220 rpm. Two shafts are 1.25m apart. The coefficient of friction is 0.25. Determine the width of the belt. **(10 Marks)**

Module-5

9 a. With usual notations derive the equation $C = I W W_P$. **(06 Marks)**

b. Each road wheel of motor cycle has a moment of inertia of 2 kg m^2. The rotating parts of the engine of the motor cycle has the moment of inertia of 0.2kg m^2. The speed of the engine is 5 times the speed of the wheel and is in the same sense. The mass of the motor cycle with rider is 200kg and its c – g is 500mm above ground level. The diameter of the wheel is 500mm. The motor cycle is travelling at 15m/sec on a curve of 30m radius. Determine
i) Gyro couple ii) Centrifugal couple iii) Overturning couple and balancing couple interms of angle of heel. Also find the angle of heel. **(10 Marks)**

OR

10 The following data relate to a symmetrical circular cam operating on flat faced follower. Least radius equals 25mm, nose radius equals 8mm, life of the valve equals 10mm, angle of action of cam = 120°. Cam shaft speed = 1000 rpm. Determine i) Flank radius ii) Maximum velocity iii) Maximum Acceleration and iv) Maximum retardation. **(16 Marks)**

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