CBCS SCHEME

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15AU52

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Discuss static equilibrium of i) Two force ii) Three force iii) Two force and torque member. **(06 Marks)**

b. Calculate the driving torque, T_2 for the mechanism shown in Fig.Q.1(b). Given AB = 100mm, BC = 300mm, F = 1000N. **(10 Marks)**

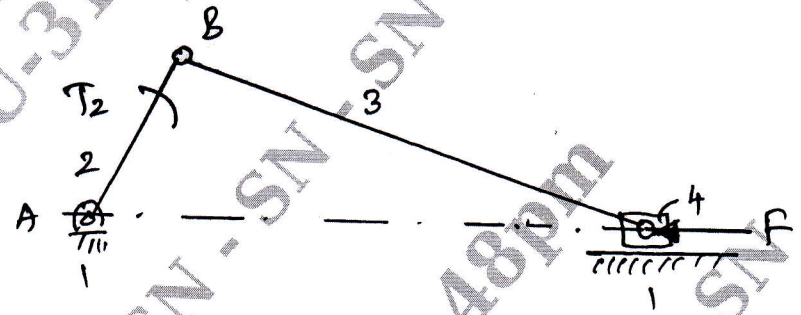

Fig.Q.1(b)

OR

2 a. Give an account of D' Alembert's principle. **(04 Marks)**

b. When the crank is 45° from IDC on the down stroke, the effective steam pressure on the piston of a vertical steam engine is 2.5bar. The diameter of the cylinder equals 0.75m, stroke of piston equals 0.50m and length of connecting rod equals 1m. Determine the torque on the crank shaft, if the engine runs at 350rpm and the mass of reciprocating parts is 200 kg. **(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 all masses and angular position of A so that the system may completely be balanced. **(12 Marks)**

OR

4 The Pistons of 4-cylinder vertical inline 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 a. Define coefficient of fluctuation of speed and coefficient of fluctuation of energy. **(04 Marks)**

b. The turning moment diagram of a multi cylinder engine with respect to mean energy line are given by -0.35, +4.1, -2.85, +3.25, -3.35, +2.6, -3.65, +2.85, -2.6 cm^2. Each cm^2 = 500Nm of torque. The speed is 1000rpm with fluctuation of speed as 2% mean speed. Find suitable diameter and cross section of nm of fly wheel if ρ = 7200 kg/m^3 and safe stress 6MPa. Take width of cross section as twice the thickness of flywheel. **(12 Marks)**

OR

6 a. Define stability, sensitiveness of governor. **(04 Marks)**

b. The arms of porter governor are each 300mm long and are hinged on the axis of rotation. The mass of each ball is 5kg. The radius of rotation of the ball is 200mm when the governor begins to lift and 250mm at the maximum speed. Determine the maximum and minimum speeds, if the mass of the sleeve is 15kg. Also find the range of speed if the frictional force at the sleeve is 30N. **(12 Marks)**

Module-4

7 a. Give the laws of friction. **(03 Marks)**

b. Determine an expression for frictional torque in flat pivot bearing. **(05 Marks)**

c. In a thrust bearing the external and internal diameters of the contact surfaces are 300mm and 200mm respectively. The total axial load is 100kN and the intensity of pressure is 250kN/m^2. The speed of the shaft is 500rpm and coefficient of friction equals 0.05. Calculate: i) Number of collars required ii) Power lost due to friction. **(08 Marks)**

OR

8 a. With usual notation derive the expression $\frac{T_1}{T_2} = e^{\mu\theta}$. **(06 Marks)**

b. A belt which is embracing 165° of a pulley of effective diameter 1000mm is transmitting 10kW. The pulley is running at 250rpm. The coefficient of friction is 0.3. Mass of belt material is 0.0012 gm/mm^3, thickness of belt equals 10mm. Considering centrifugal tension, find width of belt. Safe working stress equals 1.5MPa. Also determine the initial tension in the belt drive. **(10 Marks)**

Module-5

9 a. With usual notations derive the equation $C = IWW_p$. **(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 0.2 kg 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, lift 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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