EVENING

12 MAR 2021

[Total No. of Question: 09] [Total No. of Pages: 2]

Univ. Roll No.....

Program/Course: B.Tech. (Sem- 4th)
Name of subject: Theory of Machines
Subject Code: PCME-106
Paper ID:16195

Time Allowed: 3 Hours **Max. Marks: 60**

NOTE:

1) **Parts A and B are compulsory**
2) Part C has Two questions Q8 and Q9. Both are compulsory, but with internal choice.
3) Any missing data may be assumed appropriately

Section- A [Marks: 02 each]

Q1.

a) What is Grashoff's criterion?

b) State the conditions of correct gearing.

c) Discuss briefly the function of a clutch in IC engines.

d) What do you understand by "initial tension in belt"?

e) Differentiate between cam angle and pressure angle.

f) What is hammer blow? What are its effects?

Section- B [Marks: 04 each]

Q2. A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20^{o} pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio.

Q3. What is free body diagram also explain its importance with neat sketch of single slider crank mechanism.

Q4. An open belt drive connects two pulleys 1.2m and 0.5m diameter, on parallel shafts 4 meters apart. The mass of the belt is 0.9 kg per metre and the maximum tension is not to exceed 2000 N. the coefficient of friction is 0.3. The 1.2m pulley, which is the driver, runs at 200 r.p.m. due to belt slip on one of the pulleys, the velocity of the driven shaft is 450r.p.m. calculate the torque on each of the two shafts, the power transmitted, and power lost in friction. What is the efficiency of the drive?

Q5. A, B, C and D are four masses carried by a rotating shaft at radii 110,135,210,170 mm respectively. The planes in which masses revolve are spaced 600 mm apart and the mass of B, C and D are 15 kg, and 6 Kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance.

Q6. Sketch and describe the working of two different types of quick return mechanisms. Give examples of their applications. Derive an expression for the ratio of times taken in forward and return stroke for one of these mechanisms.

Q7. Derive an expression for the balancing of V-engines.

Section- C [Marks: 12 each]

Q8. Construct the profile of a cam to suit the following specifications:

Cam shaft diameter = 40 mm ; Least radius of cam = 25 mm ; Diameter of roller = 25 mm; Angle of lift = 120° ; Angle of fall = 150° ; Lift of the follower = 40 mm ; Number of pauses aretwo of equal interval between motions. During the lift, the motion is S.H.M. During the fall the motion is uniform acceleration and deceleration. The speed of the cam shaft is uniform. The line of stroke of the follower is off-set12.5 mm from the centre of the cam.

OR

Describe any three inversions of double slider crank chain with neat skectches.

Q9. Find out the acceleration of the slider D and the angular acceleration of link CD for the engine mechanism shown in Fig. 1 the crank OA rotated uniformly at 180 r.p.m. in clockwise direction. The various lengths are: OA = 150 mm, AB = 450 mm; PB =240 mm; BC=210 mm; CD= 660 mm.

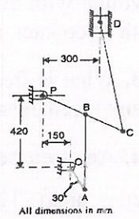

Fig 1.

OR

Two shafts A and B are co-axial. Gear C having 50 teeth is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. Sketch the arrangement and find the number of teeth on internal gear G assuming that all gears have the same module. If the shaft A rotates at 110 r.p.m., find the speed of shaft B.

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