

Roll No. _____
Total No. of Questions : 09

Total No. of Pages : 04

B.Tech. (ME) (2011 Batch) (Sem.-3rd)
THEORY OF MACHINES-I
Subject Code : BTME-302
Paper ID : [A1139]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

I. Answer briefly :

- What is the difference between Whitworth and Crank and Slotted lever mechanism ?
- Explain coriolis acceleration.
- Describe pantograph.
- Explain the term creep in belts.
- What is a cam ?
- What is the difference between brake and dynamometer ?
- What is the difference between flywheel and governor ?
- Explain stability and hunting related to governor.
- What is the difference between Porter and Proell governor ?
- What do you mean by pressure angle of cam ?

SECTION-B

- In Fig.-1 a slider crank chain is shown. Name the inversions (with figures) by fixing link 1 of the chain.

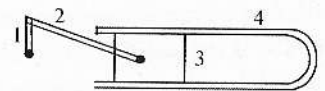


Fig.-1

- Two parallel shafts indicated in Fig.-2 are connected by a Hooke's joint at each end. Show the arrangement to obtain a constant angular velocity ratio between the driving and driven shafts.

The intermediate shafts of the arrangement has 3 gm² and is inclined at 30° to the axes of the driving and driven shafts. If the driving shaft rotates uniformly at 2400 rpm, determine the maximum torque.

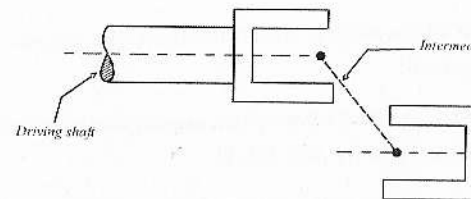


Fig.-2

- For the configuration shown in Fig.-3, determine the angular velocity of link 4 by the instant centre method if $V_A = 635$ mm/sec with ω_2 turning clockwise.

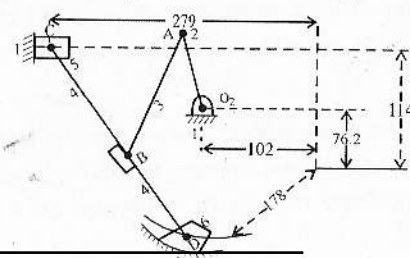


Fig.-3

5. A thrust bearing of a propeller shaft consists of a number of collars. The shaft is of 400 mm diameter and rotates at a speed of 90 r.p.m. The thrust on the shaft is 300 kN. If the intensity of pressure is to be 200 kN/m² and coefficient of friction is 0.06, determine the external diameter of the collars. The power lost in friction is not to exceed 48 kW.
6. 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 gm/mm³. Safe stress in the belt is not to exceed 2.5 N/mm². Diameter of the driving pulley is 250 mm where as the speed of the driven pulley is 220 r.p.m. The two shafts are 1.25 m apart. The coefficient of friction is 0.25. Determine the width of the belt.

SECTION-C

7. Draw the profile of a cam with an oscillating roller follower to the following specifications :
- Follower to move outwards through an angular displacement of 20° during 120° of cam rotation with S.H.M.
 - Follower to return to its initial position during 120° of cam rotation with S.H.M.
 - Follower to dwell during the remaining 120° of cam rotation.

The pivot of the oscillating follower is 12 cm from the axis of rotation of the cam, the distance between the pivot centre and the roller centre is 11 cm, the roller is 3 cm diameter and minimum radius of cam is 4.5 cm.

8. In a Whitworth quick return motion, as shown in Fig.-4, OA is a crank rotating at 30 r.p.m. in clockwise direction. Determine the acceleration of the sliding block R. OA = 150 mm; OC = 100 mm, CD = 125 mm and DR = 500 mm.

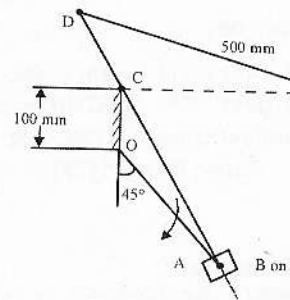


Fig.-4

9. (a) An engine develops 200 kW at a mean speed of 1200 r.p.m. The coefficient of fluctuation of speed is $\pm 2\%$. The moment of inertia of flywheel is 20 kg-m². The coefficient of fluctuation of energy is 0.10. Knowing the diameter of flywheel as 2.0 m, density of flywheel material as 7200 kg/m³, spokes provide 5% of the rotational inertia. Determine the mass and cross sectional area of the flywheel.
- (b) A governor of the Hartnell type has equal arms of length 110 mm vertically and 150 mm horizontally. The initial radius of the flywheel is 200 mm. The initial force on the spring is 100 N. Determine the force on the spring if the speed for an increase of 240 rpm.