Roll No. **Total No. of Pages : 04**

Total No. of Questions : 09

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 :

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

SECTION-A

1. **Answer briefly :**

   (a) What is the difference between Whitworth and Crank and Slotted lever mechanism ?

   (b) Explain coriolis acceleration.

   (c) Describe pantograph.

   (d) Explain the term creep in belts.

   (e) What is a cam ?

   (f) What is the difference between brake and dynamometer ?

   (g) What is the difference between flywheel and governor ?

   (h) Explain stability and hunting related to governor.

   (i) What is the difference between Porter and Proell governor ?

   (j) What do you mean by pressure angle of cam ?

SECTION-B

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

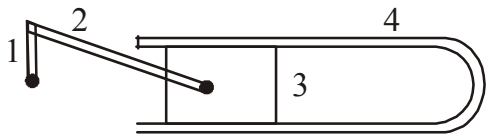

Fig.-1

link 1 = crank

link 2 = connecting rod

link 3 = slider

link 4 = cylinder block.

3. Two parallel shafts indicated in Fig.-2 are connected by an intermediate shaft with a Hooke's joint at each end. Show how the joint should be oriented to obtain a constant angular velocity ratio between the driving and driven shafts.

   The intermediate shafts of the arrangement has a mass moment of inertia 3 gm^2 and is inclined at 30° to the axes of the driving and driven shafts. If the driving shaft rotates uniformly at 2400 rpm with a steady input torque of 300 N-m, determine the maximum fluctuation of the output torque.

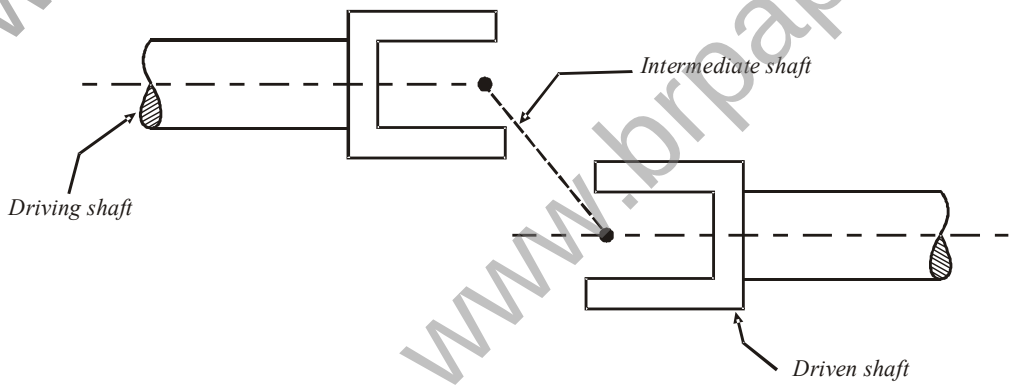

Fig.-2

4. For the configuration shown in **Fig.-3**, determine V_D by instantaneous centre method if V_A = 635 mm/sec with w_2 turning counter clockwise.

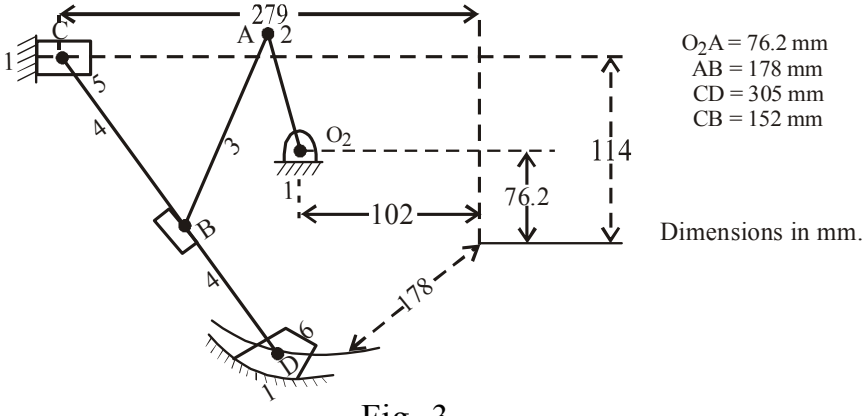

Fig.-3

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/m^2 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/mm^3. Safe stress in the belt is not to exceed 2.5 N/mm^2. 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 :

   (a) Follower to move outwards through an angular displacement of 20° during 120° of cam rotation with S.H.M.

   (b) Follower to return to its initial position during 120° of cam rotation with S.H.M.

   (c) 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.

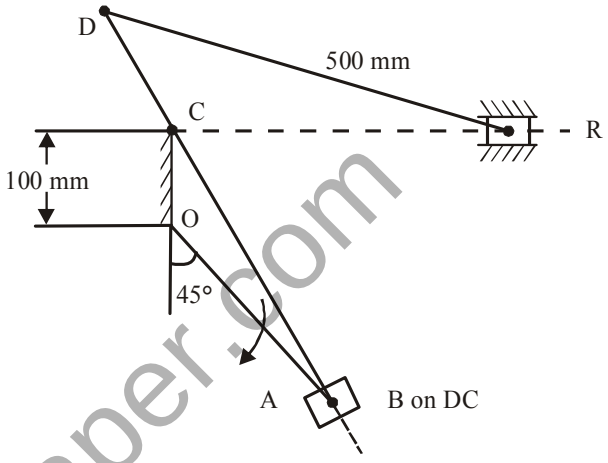

Fig.-4

9. (a) An engine develops 200 kW at a mean speed of 100 rpm. The coefficient of fluctuation of speed is ± 2% of mean speed and coefficient of fluctuation of energy is 0.10. Knowing the diameter of flywheel rim as 2.0 m, density of flywheel material as 7200 kg/m^3 and the hub and spokes provide 5% of the rotational inertia of the flywheel, find the mass and cross sectional area of the flywheel rim.

(b) A governor of the Hartnell type has equal balls of mass 3 kg, set initially at a radius of 200 mm. The arms of the bell crank lever are 110 mm vertically and 150 mm horizontally. Find initial compression force on the spring if the speed for an initial ball radius of 200 mm is 240 rpm.