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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (ME) (Sem.-3rd) (2011 Batch)

THEORY OF MACHINES-I

Subject Code : BTME-302

Paper ID : [A1139]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTION 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 has to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

SECTION-A

1. Write briefly :

- (a) Write the conditions where Coriolis acceleration is applicable.
- (b) What is the difference between Crank and Slotted and Whitworth quick return mechanisms as far as the inversion of single slider crank chain is concerned ?
- (c) Write two advantages of Ackermann steering gear mechanism.
- (d) Define creep in belts.
- (e) Define pitch point in cams and followers.
- (f) What is a Tangent Cam ?
- (g) Write the application of single plate clutch.
- (h) How the function of flywheel is different in the engine and when fitted with punching press ?
- (i) What is the drawback of Watt Governor ?
- (j) Write the applications of centrifugal clutch.

SECTION-B

2. Explain why higher pairs cannot be inverted ?
3. In Fig.-1 single slider crank chain is shown.

link 1 → Crank
link 2 → Connecting rod
link 3 → Slider
link 4 → Cylinder

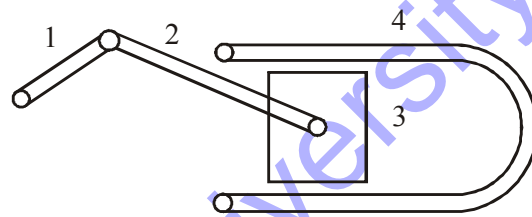


Fig.-1

Explain various inversions if link 2 of the above chain is fixed.

4. For the mechanism shown in Fig.-2, find velocity V_B if $N_2 = 160$ r.p.m.

$$O_2O_3 = 24 \text{ mm}$$

$$O_3B = 94 \text{ mm}$$

$$O_3A = 47.5 \text{ mm}$$

$$O_2P = 37.5 \text{ mm}$$

$$O_3P = 29 \text{ mm}$$

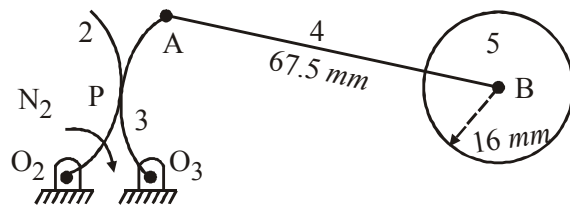


Fig.-2

5. In a Davis steering gear, the distance between the pivots of the front axle is 1.2 m and the wheel base is 2.7 m. Find the inclination of the track arm to the longitudinal axis of the car when it is moving along a straight path.
6. A prime mover running at 300 r.p.m. drives a D.C. generator at 500 r.p.m. by a belt drive. Diameter of the pulley on the output shaft of the prime mover is 600 mm. Assuming a slip of 3%, determine the diameter of the generator pulley if the belt running over it is 6 mm thick.

SECTION-C

7. (a) An offset translating roller follower is driven by a S.H.M. cam rotating at 600 r.p.m. The lift of the follower = 3 cm during 150° cam rotation and the prime circle radius of the cam = 4 cm. If the amount of offset is 0.5 cm, find
- (i) the pressure angle for the offset follower at a cam angle of 60° and
 - (ii) the pressure angle for the radial follower for the cam angle of 60° .
- (b) Explain critical speed of drum in case of dynamometer.
8. 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
- (a) The initial compressive force on the spring, if the speed for an initial ball radius of 200 mm is 240 r.p.m., and
 - (b) The stiffness of the spring required to permit a sleeve movement of 4 mm on a fluctuation of 7.5 percent in the engine speed.
9. A steam engine develops 300 kW at 120 r.p.m. The coefficient of energy as found from the turning moment diagram is to be 0.1 and the fluctuation of speed is to be kept within $\pm 1\%$ of the mean speed. Find the mass of the flywheel required, if the radius of gyration is 2 m.