

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-IV (NEW) EXAMINATION – WINTER 2024

Subject Code:3142006

Date:27-11-2024

Subject Name:Analysis of Mechanisms

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1**
- (a) Define: Mechanism, Machine, Rigid body **03**
- (b) What is degree of freedom? How is it determined? Explain with a slider crank mechanism example. **04**
- (c) For the kinematic linkage shown in Fig.1 , Calculate **07**
- (1)number of binary,ternary links etc.
- (2)number of total links
- (3)number of loops,joints or pairs,degree of freedom
- Q.2**
- (a) Draw any two inversions of slider crank mechanism. **03**
- (b) Classify the kinematic pairs based on number of constraints. **04**
- (c) In a mechanism shown in Fig. 2, the angular velocity of crank OA is 15 rad/sec and the slider at E is constrained to move at 2.5 m/sec. The motion of both the sliders is vertical and the link BC is horizontal as shown. Determine the (i) rubbing velocity at B if the pin diameter is 15 mm (ii) velocity of slider D **07**
- OR**
- (c) The crank and connecting rod of an engine are 0.5 m and 2 m long respectively. The crank makes 180 rpm. in the clockwise direction. When it has turned 45° from the inner dead centre position, Determine:
1. Velocity of piston,
2. Angular velocity of connecting rod,
- 3.Velocity of point E on the connecting rod 1.5 m from the gudgeon pin,
- 4.Velocities of rubbing at the pins of the crank shaft, crank and crosshead when the diameters of their pins are 50 mm, 60 mm, and 30 mm respectively,
5. Position and linear velocity of any point G on the connecting rod which has the least velocity relative to crank shaft. Refer Fig.3. **07**
- Q.3**
- (a) What are the types of vibrations? Explain any one with example. **03**
- (b) What are the types of cams? Explain any two with neat sketches. **04**
- (c) Classify the pulley drives. **07**
- OR**
- Q.3**
- (a) What are the causes of vibrations? Explain. **03**
- (b) Explain any one type of friction clutch with neat sketch. **04**
- (c) Explain any two types of brakes with neat sketches. **07**
- Q.4**
- (a) Differentiate between static and dynamic balancing. **03**
- (b) Derive a governing equation for single degree of freedom spring mass system with neat sketch. **04**
- (c) Derive the equation for length of belt in open belt drive. **07**

OR

- Q.4 (a) What are the effects of unbalance? Explain. 03
 (b) What are the types of gears used for parallel shaft axes configurations? 04
 (c) A cam with a minimum radius of 25 mm is to be designed for a knife-edge follower with the following data: To raise the follower through 35 mm during 60° rotation of the cam Dwell for next 40° of the cam rotation Descending of the follower during the next 90° of the cam rotation Dwell during the rest of the cam rotation Draw the profile of cam if the ascending and descending of the cam with simple harmonic motion and the line of stroke of the follower is offset 10 mm from the axis of the cam shaft. 07
- Q.5 (a) Define: Module, Tooth thickness, Addendum circle with neat sketch. 03
 (b) Discuss the law of belting. 04
 (c) Discuss the gyroscopic effects in four-wheeler taking left turn with related equations and figures. 07

OR

- Q.5 (a) Explain how the gyroscopic torque is calculated. 03
 (b) What is the law of gearing? 04
 (c) Briefly discuss the gyroscopic effects on naval ship taking right turn. 07

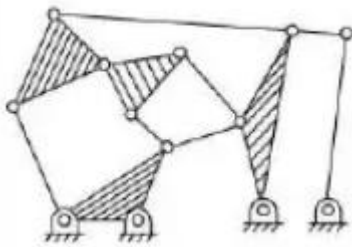


Fig.1,Q 1(b)

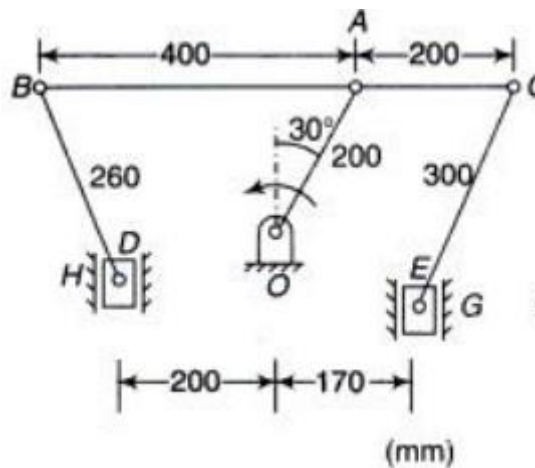


Fig.2,Q 2(c)

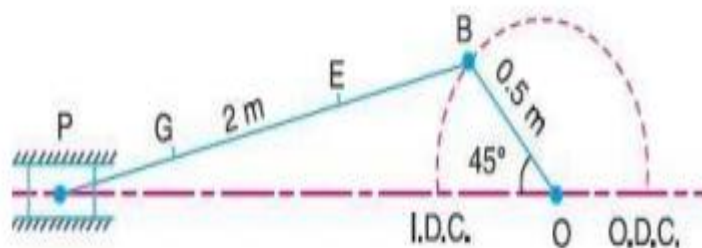


Fig.3, Q.2 (c) OR