

# GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III EXAMINATION – SUMMER 2025

**Subject Code:3132505**

**Date:06-06-2025**

**Subject Name:Kinematics and Dynamics of Machines**

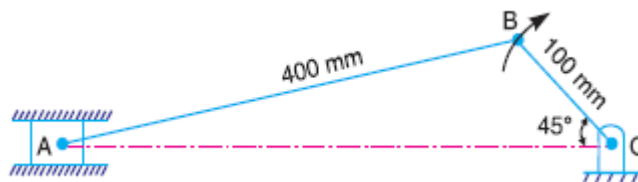
**Time:02:30 PM TO 05:00 PM**

**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.

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Q.1*</b> (a) Give the Difference between machine and structure.                                                                                                                                                                                                                                                                           | <b>03</b> |
| (b) Classify Kinematic Pair according to the type of relative motion between elements.                                                                                                                                                                                                                                                       | <b>04</b> |
| (c) Define inversion of kinematic chain and explain the inversion of four bar kinematic chain.                                                                                                                                                                                                                                               | <b>07</b> |
| <b>Q.2</b> (a) What is instantaneous centre of mechanism? What are the properties of the instantaneous centre?                                                                                                                                                                                                                               | <b>03</b> |
| (b) Explain application of Kutzbach Criterion to Plane Mechanisms.                                                                                                                                                                                                                                                                           | <b>04</b> |
| (c) What do you mean by Rubbing Velocity at a pin joint? What is rubbing velocity when a pin connects one sliding member & the other turning member?                                                                                                                                                                                         | <b>07</b> |
| <b>OR</b>                                                                                                                                                                                                                                                                                                                                    |           |
| (c) Locate all the instantaneous centres of the slider crank mechanism as shown in Fig. 6.12. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively.<br>If the crank rotates clockwise with an angular velocity of 10 rad/s, find: 1. Velocity of the slider A, and 2. Angular velocity of the connecting rod AB. | <b>07</b> |



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|-------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Q.3</b> (a) Define following terms of gear terminology: - Pitch circle diameter, Circular pitch and Diametral pitch. | <b>03</b> |
| (b) What is interference in gear pair and list out the method to avoid it?                                              | <b>04</b> |
| (c) Define speed ratio and train value for simple gear train.                                                           | <b>07</b> |
| <b>OR</b>                                                                                                               |           |
| <b>Q.3</b> (a) What is a reverted gear train? Where is it used?                                                         | <b>03</b> |
| (b) What is centrifugal effect on belt? How it effects on power transmission?                                           | <b>04</b> |

- (c) A single reduction gear of 120 kW with a pinion 250 mm pitch circle diameter and speed 650 r.p.m. is supported in bearings on either side. Calculate the total load due to the power transmitted, the pressure angle being  $20^\circ$ . **07**
- Q.4** (a) Give classification of chains used in chain drive. **03**  
 (b) Define following terms of gear terminology: - Module, Clearance and Total depth. **04**  
 (c) Derive an equation for tension ratio for flat belt drive. **07**
- OR**
- Q.4** (a) What is the effect of gyroscopic couple on stability of four wheel drive moving in a curved path? **03**  
 (b) Define (i) Angular velocity of precession (ii) axis of precession (iii) processional angular motion **04**  
 (c) Explain in what way the gyroscopic couple affects the motion of an aircraft while taking turn. **07**
- Q.5** (a) Give the definition of damping, stiffness and free vibration **03**  
 (b) Define logarithmic decrement. Derive the relationship between logarithmic decrement and damping ratio. **04**  
 (c) Explain free vibration of critical damped system in detail. **07**
- OR**
- Q.5** (a) Briefly explain vibration isolation and transmissibility. **03**  
 (b) Differentiate between static balancing and dynamic balancing. **04**  
 (c) Four masses  $m_1$ ,  $m_2$ ,  $m_3$  and  $m_4$  are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are  $45^\circ$ ,  $75^\circ$  and  $135^\circ$ . Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m. **07**

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