

Roll No. 

Total No. of Pages : 2

Total No. of Questions : 09

B.Tech. (AE/ME/IE(2008 Batch)) (Sem.-4)

**THEORY OF MACHINES-II**

Subject Code : ME-204

Paper ID : [A0809]

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 :

- i) Write the concept of free body diagram.
- ii) Describe the disadvantage of unbalance masses of any system.
- iii) Write the various sources of forces in mechanism.
- iv) Write the conditions of complete balancing of reciprocating parts of an engine.
- v) Differentiate between module pitch and diametral pitch of a gear.
- vi) State the conditions of correct gearing.
- vii) Draw the diagrams of compound and reverted gear trains.
- viii) Explain the concept of gyroscopic motion.
- ix) Explain the word synthesis in reference to mechanism.
- x) Differentiate among rack, pinion and gear.

**SECTION-B**

2. Describe the graphical method for determining the inertia forces in a horizontal reciprocating engine.
3. Describe the balancing of several unbalance masses revolving in the same plane by graphical and analytical methods with suitable example.

4. Define pressure angle with the help of a neat sketch and write its importance in gears. What is the effect of pressure angle on arc of recess and arc of approach of two mating gears?
5. A uniform disc of 100mm diameter and 5 kg is mounted midway between bearings which are 200 mm apart and keep it in a horizontal plane. The disc spins about its axis with a constant speed of 1200 rpm counter clockwise when viewed right hand side bearing. If the disc precess about the vertical axis by 50 rpm anticlockwise looking from top, then find the resultant reactions at each bearing due to the mass and gyroscopic effects.
6. Two spiral gears in mesh have the following data-
- |                         |            |
|-------------------------|------------|
| Angle of friction       | $6^\circ$  |
| Normal pitch            | 20 mm      |
| Shaft angle             | $55^\circ$ |
| Speed ratio             | 3          |
| Approx. center distance | 400 mm     |
| Spiral angle of pinion  | $25^\circ$ |
- Determine (a) exact center distance (b) number of teeth in each wheel (c) efficiency of the drive.

### SECTION-C

7. State how epicyclic gear train is different from other gear trains? With the help of suitable example, describe the method to analyze epicyclic gear train.
8. The following data refer to two cylinder locomotive with crank at  $90^\circ$
- |   |        |
|---|--------|
| Reciprocating mass per cylinder                   | 300 kg |
| Crank radius                                      | 0.30 m |
| Driving wheel diameter                            | 1.80 m |
| Distance between cylinder center lines            | 0.65 m |
| Distance between the driving wheels central plane | 1.55m  |
- Determine (a) the fraction of the reciprocating masses to be balance, if the hammer blow is not to exceed  $46 \times 10^3$  at 96.5 km/hr (b) the variation in tractive effort (c) the maximum swaying couple.
9. A four bar mechanism is required such that the input and output angles are coordinated as given in the table:

Input crank angle	$30^\circ$	$50^\circ$	$80^\circ$
Output follower angle	$0^\circ$	$30^\circ$	$60^\circ$

Synthesise the mechanism