

Seat No. **MAR_APR 2025 SUMMER EXAMINATION****11731 Bachelor of Technology (NEP-2.0)****Sub. Name: Theory of Machine - II****Sub. Code: 66242/80754/81008****Day and Date: MAY ,06-05-2025****Total Marks: 70****Time: 02:30 PM To 05:00 PM**

- Instructions:**
1. All questions are compulsory
 2. Assume suitable data wherever necessary and mention it boldly
 3. Figures to the right indicate full marks
 4. Use of scientific calculator and logarithmic table is allowed

Q1) Attempt the following **[10]**

- a. Derive condition for constant velocity ratio of toothed wheels. **[4]**

OR

Derive the expression for the length of path of contact with usual notations.

- b. The following data relate to a pair of 20° involute gears in mesh : Module = 6 **[6]**
 mm, Number of teeth on pinion = 17, Number of teeth on gear = 49 ; Addenda on pinion and gear wheel = 1 module. Find : 1. The number of pairs of teeth in contact ; 2. The angle turned through by the pinion and the gear wheel when one pair of teeth is in contact

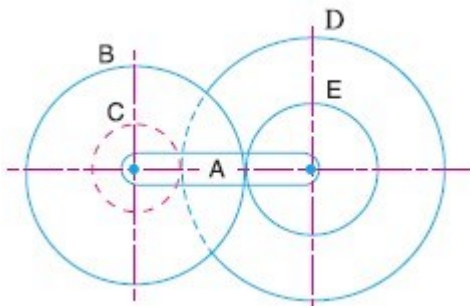
Q2) Attempt the following **[12]**

- a. Write a note on various types of gear trains. **[4]**

OR

An epicyclic gear train consists of sun, planet, arm and annular gear. Derive the equation of velocity ratio.

- b. In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise. **[8]**



Q3) Attempt the following

- a. Explain with sketch active couple and reactive couple as related to gyroscope. **[4]**

OR

Derive the expression for gyroscopic couple magnitude

- b. An aeroplane makes a complete half circle of 50 metres radius, towards left, when flying at 200 km per hr. The rotary engine and the propeller of the plane has a mass of 400 kg and a radius of gyration of 0.3 m. The engine rotates at 2400 r.p.m. clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it. **[8]**

Q4) Attempt the following**[12]**

- a. Explain different types of dynamic forces acting in single slider crank chain mechanism **[4]**

OR

Derive an expression for velocity and acceleration of the connecting rod of slider crank mechanism.

- b. If the crank and the connecting rod are 300 mm and 1 m long respectively and the crank rotates at a constant speed of 200 r.p.m., determine: 1. The crank angle at which the maximum velocity occurs, and 2. Maximum velocity of the piston **[8]**

Q5) Attempt the following**[12]**

- a. Explain balancing of several masses rotating in same plane. **[4]**

OR

Discuss how a single revolving mass is balanced by two masses revolving in different planes.

- b. A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45° , B to C 70° and C to D 120° . The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions. **[8]**

Q6) Attempt the following**[12]**

- a. Explain Turning moment diagram for a four stroke cycle internal combustion engine. **[4]**

OR

Explain coefficient of fluctuation of speed

- b.** The turning moment diagram for a petrol engine is drawn to the following scales : Turning moment, 1 mm = 5 N-m ; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm². The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m. **[8]**

End Of Question Paper

Important Note for Chief Exam Officer / SRPD Coordinator / Sr Supervisor/ Student -

This Question Paper may be distributed for following Subjects as common code.

सदरची प्रश्नपत्रिका खालील विषयांकरिता वितरित करता येईल.

- 1] (101) Bachelor of Engineering (81008) Theory of Machine - II Part 3 SEM 5
- 2] (101) Bachelor of Engineering (66242) Theory of Machine - II Part 3 SEM 5
- 3] (1154) B.Tech. CBCS (80754) Theory of Machine - II Part 3 SEM 5