

CBCS SCHEME

17MT45

USN

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024

Theory of Machines

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define the following ;
i) kinematic pair ii) Structure iii) Mechanism iv) Kinematic Link v) Machine. (10 Marks)
b. Explain the Inversion of four bar chain mechanism. (10 Marks)

OR

- 2 a. With a neat sketch, explain Ratchet and Pawl mechanism. (10 Marks)
b. Explain classification of kinematic pair. (10 Marks)

Module-2

- 3 a. Explain Law of Gearing with neat sketches. (10 Marks)
b. A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gear is involute with 20° pressure angle, 12mm module and 10mm addendum. Find the length of path of contact, arc of contact and contact ratio. (10 Marks)

OR

- 4 a. Explain the different types of Gear trains with velocity ratio. Give examples for each. (10 Marks)
b. In an epicyclic gear train shown in Fig Q4(b), the arm A is fixed to the shaft 'S'. The wheel 'B' having 100 teeth rotates freely on this shaft 'S' wheel 'F' 150 teeth is separately driven. If the arm A runs at 200rpm, wheel F 100rpm in the same direction find.
i) No of teeth of Gear C ii) Speed of wheel 'B'.

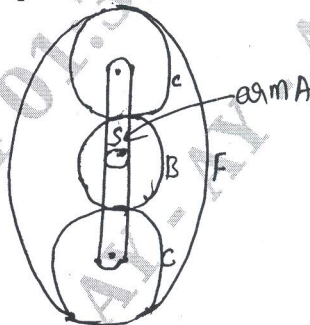


Fig Q4(b)

(10 Marks)

Module-3

- 5 Construct a cam operating a knife-edged follower which has the following data :
i) Follower moves outwards through 40mm during 60° of cam rotation.
ii) Follower dwells for the next 45°
iii) Follower returns to its original position during next 90°
iv) Follower dwells for the rest of the motion
v) The displacement of the follower is to take place with SHM during both the outward and return strokes
vi) The least radius of the cam is 50mm
vii) The axis of the follower is offset 20mm towards right from the cam axis. (20 Marks)

OR

- 6 A cam rotating clockwise at uniform speed of 300rpm operates a reciprocating follower through a roller 1.5cm diameter. The follower motion is defined as below :
- Outward during 150° with UARM
 - Dwell for next 30°
 - Return during next 120° with SHM
 - Dwell for the remaining period
- Stroke of the follower is 3cm, Minimum radius of the cam is 3cm, draw the cam profile.
Follower axis passes through cam axis. (20 Marks)

Module-4

- 7 a. Briefly explain the need of Balancing in machines. (08 Marks)
b. Five masses M_1 , M_2 , M_3 and M_5 revolve in the same plane. Magnitudes of M_1 , M_2 , and M_3 are 5, 2.5 and 4Kg respectively. Angular position of M_2 , M_3 , M_4 and M_5 are 60° , 135° , 210° and 270° from M_1 . Determine the masses M_4 and M_5 . (12 Marks)

OR

- 8 a. Derive an impression for ratio of driving tensions for flat belt drive. (10 Marks)
b. Power is required to transmit from a 300mm diameter pulley running at 500rpm through an open belt drive to a pulley of 500mm diameter. The centre distance between the pulley is 1.5m and the coefficient of friction in the belt drive is 0.3. If the safe pull in the belt is not to exceed 600N, determine the power transmitted by the belt drive. Also find the length of the open belt required. (10 Marks)

Module-5

- 9 a. Analyze the stability of a 2 wheel vehicle taking left turn derive the necessary equations. (10 Marks)
b. Explain the effect of gyroscopic couple of an Aeroplane. (10 Marks)

OR

- 10 a. Define the following :
i) Sensitiveness ii) Hunting iii) Stability iv) Isochronous Governor (08 Marks)
b. The arms of a porter governor are each 30cm long and are pivoted on the governor axis. Mass of each ball is 2Kg. At the mean speed of 150rpm, the arm makes 30° with a vertical. Determine the central load and the sensitivity of the governor if the sleeve movement is ± 2.5 cm. (12 Marks)
