

CBCS SCHEME

18MT45

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 link
 - (ii) Kinematic pair.
 - (iii) Kinematic chain.
 - (iv) Mechanism
 - (v) Inversion
- (10 Marks)
- b. With a neat sketch, explain the following :
- (i) Crank and lever mechanism.
 - (ii) Elliptical trammel.
- (10 Marks)

OR

- 2 a. Discuss Whitworth quick return motion mechanism with a neat sketch. (10 Marks)
- b. Explain Ratchet and Pawl mechanism with a neat sketch. (10 Marks)

Module-2

- 3 a. Explain the law of gearing. (08 Marks)
- b. Derive the relation for minimum number of teeth on the gear wheel and the pinion to avoid interference. (12 Marks)

OR

- 4 a. Classify and explain gear trains. (10 Marks)
- b. An epicyclic gear train is shown in Fig. Q4 (b). The number of teeth on A and B are 80 and 200. Determine the speed of arm a (i) if A rotates at 100 rpm clockwise and B at 50 rpm counter-clockwise (ii) If A rotates at 100 rpm clockwise and B is stationary. (10 Marks)

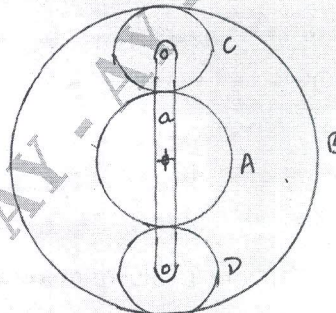


Fig. Q4 (b)

Module-3

- 5 a. Discuss different types of cams. (10 Marks)
- b. Explain different types of followers. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 Draw the profile of a cam operating a knife-edge follower having a lift of 30 mm. The cam raises the follower with SHM for 150° of the rotation followed by a period of dwell for 60° . The follower descends for the next 100° rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at a uniform velocity of 120 rpm and has a least radius of 20 mm. What will be the maximum velocity and acceleration of the follower during the lift and the return? (20 Marks)

Module-4

- 7 a. Explain static and dynamic balancing. (04 Marks)
 b. A rotating shaft carries four masses 1, 2, 3 and 4 which are radially attached to it. The mass centres are 30 mm, 38 mm, 40 mm and 35 mm respectively from the axis of rotation. The masses 1, 3 and 4 are 7.5 kg, 5 kg and 4 kg respectively. The axial distance between the planes 1 and 2 is 400 mm and 2 and 3 is 500 mm. The masses 1 and 3 are at right angles to each other. Find for complete balance,
 (i) Angle between 1, 2 and 1, 4.
 (ii) Axial distance between 3 and 4.
 (iii) Magnitude of mass 2. (16 Marks)

OR

- 8 a. Derive an expression for ratio of tensions in flat belt drive. (10 Marks)
 b. A belt runs over a pulley of 800 mm diameter at a speed of 180 rpm. The angle of lap is 165° and the maximum tension in the belt is 2 kN. Determine the power transmitted if the co-efficient of friction between the belt and the pulley is 0.3 (10 Marks)

Module-5

- 9 a. Explain the effect of gyroscopic couple on ship. (10 Marks)
 b. Discuss the stability of a two wheel vehicle taking left turn. (10 Marks)

OR

- 10 a. Define the following :
 (i) Sensitiveness
 (ii) Governor effort.
 (iii) Stability.
 (iv) Isochronism.
 (v) Controlling force. (10 Marks)
 b. A porter governor has all four arms 300 mm long. The upper arms are pivoted on the axis of rotation and lower arms are attached to the sleeve at a distance 35 mm from axis. The mass of each ball is 7 kg and the load on the sleeve is 540 N. Determine the equilibrium speed for the two extreme radii of 200 mm and 260 mm of rotation of governor balls. (10 Marks)

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