CBCS SCHEME

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18RA42

Fourth Semester B.Tech. Degree Examination, July/August 2022
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. Explain with a neat sketch of crank and slotted lever mechanism. **(10 Marks)**

b. Illustrate the principle and working operation of Whitworth mechanism with sketch. **(10 Marks)**

OR

2 a. Demonstrate the mechanism of Geneva wheel working principle with neat diagram. **(10 Marks)**

b. Explain in detail with neat sketch of Ackermann stearing gear mechanism. **(10 Marks)**

Module-2

3 a. Obtain an expression for the length of path of contact for two involute profile gears in mesh. **(10 Marks)**

b. Two spur gears have 24 and 30 teeth of module = 10 mm standard addendum = 1 module, pressure angle = 20˚. Find

(i) Length of arc of contact (ii) Contact ratio. **(10 Marks)**

OR

4 In an epicyclic gear train of sun and planet type, the pitch circle diameter of the annular wheel A is 425 mm and the module is 5 mm. When the annular wheel is stationaries, the spider which carries 3 planet gear P of equal size has to make one revolution for every 6 revolutions of the driving spindle carrying sun wheel S. Determine the number of teeth on all the wheels. **(20 Marks)**

Module-3

5 Draw to full profile of a cam operating a roller follower with the following data : Minimum radius of cam = 25 mm ; lift = 30 mm ; roller diameter = 15 mm. The cam lifts the follower for 120˚ with SHM followed by a dwell period of 30˚. Then the follower lowers down during 150˚ of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration of the follower during descent period. **(20 Marks)**

OR

6 Draw the profile of disc cam with roller follower to give a rise of 63 mm during 3/8 revolution of cam and dwell in the lifted position for 1/8 revolution and a sudden drop of the follower through 33 mm and followed by a dwell of 1/8 revolution and further fall to the lowest postion during 1/4 revolution and remain at rest for the revolution of the cam. The raise of the follower takes place through cycloidal motion and the fall will take place through SHM. Least radius of cam is 40 mm and roller diameter is 20 mm. The line of stroke of the follower is inline of the axis of cam. Assume the cam shaft to rotate clockwise – uniformly. **(20 Marks)**

Module-4

7 A shaft carries four masses A, B, C and D placed in parallel planes perpendicular to the shaft axis and in this order along the shaft. The masses B and C are 40 kg and 28 kg and both are at 160 mm radius. While the masses in planes A and D are at 200 mm radius. Angle between B and C is 100°, B and A is 190°, both angles being measured in the same sense. Planes A and B are 250 mm apart, B and C are 500 mm apart. If the shaft is to be in complete balance, determine (i) Masses in planes A and D. (ii) Distance between C and D (iii) Angular position of mass D. **(20 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 coefficient of friction between the belt and the pulley is 0.3. **(10 Marks)**

Module-5

9 a. Define Robot. List and explain different types of robots. **(10 Marks)**

b. Explain in detail of different generation of robots. **(10 Marks)**

OR

10 a. What are Asimov's laws of robotics? Briefly explain them. **(10 Marks)**

b. Explain in detail of the dynamic stabilization of robots. **(10 Marks)**

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