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Total No. of Questions : 09] **Paper ID [ME203]** **[Total No. of Pages : 03**

(Please fill this Paper ID in OMR Sheet)

B.Tech. (Semester - 3rd)

THEORY OF MACHINES (ME - 203)

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **compulsory.**
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) ***(10 x 2 = 20)***

a) Differentiate between the following:-

(i) Lower pair and Higher pair.

(ii) Turning pair and Sliding pair.

b) Define and explain the term kinematic chain. For a kinematic chain what is the relationship between number of pairs and number of links.

c) Name the two different types of steering gear mechanism. What are their merits and demerits?

d) Distinguish between initial tension and centrifugal tension in a belt.

e) Explain the phenomenon of 'slip' and 'creep' in a belt drive.

f) Define and explain the terms: Cam profile and prime circle.

g) What is the difference between a governor and a flywheel?

h) Differentiate between Pivot and collar bearing.

i) What do you mean by static and dynamic balancing?

j) What is meant by the expression friction circle?

Section - B

(4 x 5 = 20)

Q2) What is the condition of correct steering? Sketch and show the main types of steering gears and discuss their relative advantages.

Q3) Derive an expression for optimum speed of flat belt drive for the transmission of maximum power considering the effect of centrifugal tension.

Q4) Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley.

Q5) Four masses are attached to a shaft at planes A, B, C and D at equal radii. The distance of the planes B, C and D from A are 40 cm, 50 cm and 120 cm respectively. The masses at A, B and C are 60 kg, 45 kg and 70 kg respectively. If the system is in complete balance, determine the mass at D and the position of masses B, C and D with respect to A.

Q6) For a simple harmonic motion of the follower, drive expressions for the maximum velocity and maximum acceleration during the return stroke and outstroke.

Section - C

(2 x 10 = 20)

Q7) Draw the profile of a cam to give the following motion to the reciprocating follower with a flat contact face:

(a) Follower to move outward through a distance of 20 mm during 120° of cam rotation;

(b) Follower to dwell for 30° of cam rotation;

(c) Follower to return to its initial position during 120° of cam rotation;

(d) Follower to dwell for remaining 90° of cam rotation;

The minimum radius of cam is 25 mm and the flat face of the follower is at right angles to the line of stroke of the follower. The outward and the return strokes of the follower are to take place with the simple harmonic motion.

Q8) (a) 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 of 3.5 mm from the axis. The mass of each ball is 7kg and the mass on the sleeve is 54kg. If the extreme radii of rotation of the balls are 200 mm and 250 mm, find the range of speed of the governor.

(b) With a neat sketch, explain the working of Wilson-Hartnell governor.

Q9) (a) A car moving on a level road at a speed 50 km/h has a wheel base 2.8 meters, distance of C.G. from ground level 600mm, and the distance of C.G. from rear wheels 1.2 meters. Find the distance traveled by the car before coming to rest when brakes are applied to the rear wheels.

(b) What do understand by 'self-locking of a brake' and 'self-energised brake'? Should we have a 'self-locking of a brake' and 'self-energised brake'?