Roll No…….. **Total No. of Printed Pages: [2]**

Total No. of Questions: [09]

B. Tech. (Mech. Engg.) (Semester – 5th)

KINEMATICS & THEORY OF MACHINES

Subject Code: BMECS1504

Paper ID: [18112327]

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

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a. Explain the terms: i) Kinematic chain ii) Mechanism.
b. Explain the term 'height of the governor'.
c. Define Grubler's criterion for a mechanism.
d. What is the difference between radial cams and cylindrical cams?
e. Briefly explain the differences between simple and compound gear train.
f. Explain the terms related to cams (a) Pressure angle (b) Lift or Stroke?
g. Define slip and creep of belt?
h. Explain the meaning of Balancing of rotating masses?
i. What do you mean by free body diagram?
j. Explain the terms Sensitiveness and Hunting of Governor

Section – B **(5 marks each)**

Q2. Explain the construction & working of Hartnell Governor.

Q3. Explain the method of balancing of different masses revolving in the same plane.

Q4. The arms of a porter governor are 300 mm long. The upper arms are pivoted on the axis of rotation and the lower arms are attached to the sleeve at a distance of 35 mm from the axis of rotation. The load on the sleeve is 54 Kg and the mass of each ball is 7 Kg. Determine the equilibrium speed when the radius of the balls is 225 mm. What will be the range of speed for this position, if the frictional resistance to the motion of the sleeve are equivalent to a force of 30N?

Q5. Explain the effect of gyroscopic couple on an aeroplane?

Q6. Sketch and explain any two inversions of a slider crank chain.

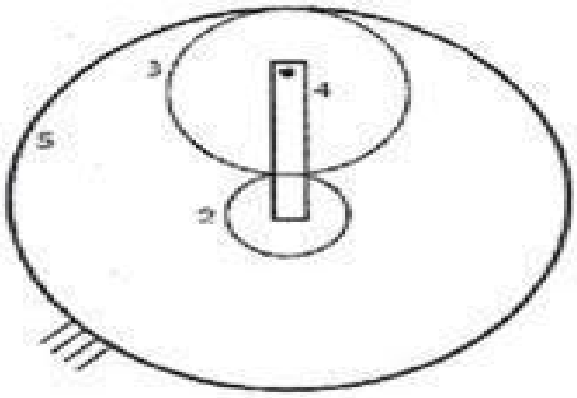
Section – C **(10 marks each)**

Q7. Derive an expression to find the length of a belt in an open belt drive and cross belt drive.

Q8. An epicyclic gear train is shown schematically in the figure:-

The sun gear 2 on the input shaft is a 20 teeth external gear. The planet gear 3 is a 40 teeth external gear. The ring gear 5 is a 100 teeth internal gear. The ring gear 5 is fixed and the

gear 2 is rotating at 60 rpm ccw (ccw=counter-clockwise and cw =clockwise). Find the speed and direction of the arm attached.



Q9. A cam is to be designed for a knife edge follower with the following data : a) Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion. b) Dwell for the next 30°. c) During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion. d) Dwell during the remaining 180°. Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft The radius of the base circle of the cam is 40 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m.