

**II B. Tech II Semester Regular Examinations, August/September - 2021**  
**KINEMATICS OF MACHINERY**  
 (Com to ME, AME)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit  
 All Questions carry **Equal** Marks

- 1 a) Distinguish between incompletely constrained motion and successfully constrained motion, with examples [8M]  
 b) What are the different Inversions of a Double Slider crank chain? Describe the working of the inversion (with a neat sketch) which can be used to convert rotary motion to reciprocating motion [7M]

Or

- 2 a) Explain inversions of a four bar chain in detail? [8M]  
 b) Explain the working of any two inversions of a single slider crank chain with neat sketches [7M]  
 3 a) With a neat sketch, explain the Davis steering gear mechanism in detail [8M]  
 b) Derive an expression for the ratio of shafts velocities for Hooke's joint and draw the polar diagram. [7M]

Or

- 4 a) Two shafts are connected by universal Hooke's joint. The driving shaft rotates at uniform speed of 1200 rpm. Determine the greatest permissible angle between the shaft axis so that the total fluctuation of speed does not exceed 100 rpm also calculate the maximum and minimum speeds of driven shaft. [8M]  
 b) What are straight line mechanisms? Describe one type of exact straight line motion mechanism with the help of a sketch [7M]  
 5 a) In a slider crank mechanism, the length of crank OB and connecting rod AB are 125mm and 500mm respectively. The centre of gravity G of the connecting rod is 275mm from the side A. The crank speed is 600rpm clockwise. When the crank has turned  $45^\circ$  from the inner dead centre position, determine: 1, velocity of a slider A, 2. velocity of point G, and 3. Angular velocity of the connecting rod AB. [8M]  
 b) What do you mean by Coriolis component of acceleration? When it will exist [7M]

Or

- 6 a) PQRS is a four bar mechanism with link PS is fixed. The lengths of the links are  $PQ=62.5\text{mm}$ ,  $QR=175\text{mm}$ ,  $RS=112.5\text{mm}$ , and  $PS=200\text{mm}$ . The crank PQ rotates at 10rad/s clock wise. Draw the velocity and acceleration diagram when the angle  $QPS = 60^\circ$  and Q and R lie on the same side PS. Find the angular velocity and angular acceleration of links QR and RS. [8M]  
 b) Draw and explain Klein's construction for determining velocity and acceleration of the piston in a slider crank mechanism [7M]  
 7 a) Derive the condition for transmitting the maximum power in a flat belt drive. [8M]  
 b) A cam profile consists of two circular arcs of radii 24 mm and 12 mm joined by straight lines giving the follower a lift of 12 mm. The follower is a roller of 24 mm radius and its line of action is a straight line passing through the cam shaft axis. When the cam shaft has a uniform speed of 500 r.p.m., find the maximum velocity and acceleration of the follower while in contact with the straight flank of the cam [7M]

Or



- 8 a) What are different types of chains? Explain, with neat sketches, the power transmission chains. [8M]
- b) A symmetrical circular cam operates a roller follower with a lift of 30 mm. The minimum radius of the cam is 50 mm, the roller radius is 18 mm, and the nose radius is 12 mm. The angle of lift is  $80^\circ$ . If the speed of the cam is 210 rpm, find the main dimensions of the cam, and the acceleration of the follower at  
(a) the beginning of the lift, and  
(b) the apex of the nose. [7M]
- 9 a) What are the various types of gear trains? Explain them with neat sketch. [8M]
- b) Two gear wheels mesh externally and are to give a velocity ratio of 3 to 1. The teeth are of involute form; module = 6 mm, addendum = one module, pressure angle =  $20^\circ$ . The pinion rotates at 90 r.p.m. Determine:  
(i) The number of teeth on the pinion to avoid interference on it and the corresponding number of teeth on the wheel.  
(ii) The length of path and arc of contact. [7M]
- Or
- 10 a) Two mating gears have 20 and 40 involute teeth of module 10 mm and  $20^\circ$  pressure angle. The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half the maximum possible length. Determine the addendum height for each gear wheel, length of the path of contact, arc of contact and contact ratio. [8M]
- b) Explain briefly the differences between simple, compound, and epicyclic gear trains. What are the special advantages of epicyclic gear trains? [7M]

