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D-C-190087

B. Tech. EXAMINATION, 2019

Semester V (CBS)

KINEMATICS OF MACHINES (ME, AE)

ME-501

Time : 3 Hours *Maximum Marks : 60*

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all, selecting *one* question from each Section A, B, C and D. Q. No. 9 is compulsory.

Section A

1. Explain and sketch six different examples of the use of planar four-bar linkage in practice. They can be found in workshops, in domestic appliances, vehicles etc. 12

2. A four bar chain of links AB, BC and CD are 100 mm, 250 and 300 mm long respectively, the link AD of chain ABCD is fixed and having length of 250 mm. The link PQ makes an angle of 120° with AD and rotates at 45 rad/sec clockwise. Determine :
   (i) Angular velocity of links BC and CD
   (ii) Angular acceleration of link BC and CD. 12

Section B

3. The reciprocating radial roller follower of a plate cam is to rise 40 mm with simple harmonic motion in 180° of cam rotation and return with simple harmonic motion in the remaining 180°. If the roller radius is 7.5 mm and the prime circle radius is 40 mm, construct the displacement diagram, velocity diagram and cam profile for clockwise cam rotation. 12

4. Draw the profile of the cam operating a roller reciprocating follower and determine the maximum velocity and acceleration during decent period with the following data : 12

   Minimum radius of Cam = 25 mm

   Roller diameter = 15 mm

Lift = 30 mm

Offset of follower axis = 12 mm towards right

Angle of ascent = 120°

Angle of descent = 30°

Angle of dwell between ascent and descent = 45°

Speed of cam = 150 r.p.m.

Section C

5. (a) 3.7 kW of power is transmitted by an open belt drive. The linear velocity, of the belt is 2.5 m/s. The angle of lap on the smaller pulley is 145°. The coefficient of friction is 0.27. Determine the effect on power transmission, if the initial tension in the belt is decreased by 12%. **8**

   (b) State and prove the law of gearing. **4**

6. (a) Discuss the advantages and disadvantages of wire ropes over fabric ropes. **4**

   (b) The gear wheels mesh externally and give a velocity ratio of 3 to 1. The teeth are of involute from having module = 3 mm and addendum = 1 module, pressure angle = 15°. The pinion rotates at 120 r.p.m. Determine :

   (i) Minimum no. of teeth on each wheel to avoid interference.

   (ii) Number of pair of teeth in contact. **8**

Section D

7. (a) Discuss the various tasks of kinematic synthesis. **4**

   (b) Graphically synthesize the four bar crank rocker mechanism for three position motion generation. **8**

8. Synthesize a four bar linkage for the purpose of generating a function $y = \log_{10} x$ in the interval $1 \leq x \leq 10$ using Freudenstein's method, for 3 accuracy points, with input link start and end angle of 45° and 105° respectively, output link start and end angle of 135° and 225° respectively. **12**

Section E

(Compulsory Question)

9. Explain the following :

   (i) Mobility

   (ii) Grashof Mechanism

   (iii) Prime circle

   (iv) Backlash of a gear

   (v) Number synthesis

   (vi) Lower Pair. **6×2=12 (2 marks each)**