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B.Tech Even Semester (CBCS) Exam., May—2019

AGRICULTURAL ENGINEERING

(4th Semester)

Course No. : AECC–12

(Kinetics and Dynamics of Machines)

Full Marks : 50
Pass Marks : 15

Time : 2 hours

Note : 1. Answer any **five** questions.

    2. Begin each answer in a new page.

    3. Answer parts of a question at a place.

    4. Assume reasonable data wherever required.

    5. The figures in the margin indicate full marks for the questions.

1. *(a)* What is the difference between machine, mechanism and structure? Enlist various inversions of four-bar chain mechanism.   3+2=5

(**2**)

(b) Explain different kinematic pairs with suitable examples. Give an example of turning pair.   4+1=5

2. *(a)* State the Kennedy's theorem of three instantaneous centers. Explain the method to find all possible I-centers of four-bar mechanism and velocity of each link.   1+4=5

(b) In a four-bar chain *ABCD*, *AD* is fixed link. Crank *AB* rotates in clockwise direction at an angular velocity of 10 rad/sec. Link *AB* 60 mm, *BC* *CD* 70 mm, *DA* 120 mm. When angle *DAB* 60° and the points *B* and *D* are on one side of the link *AD*, find angular velocity of link *BC* and link *CD*.   5

3. *(a)* A four-bar mechanism with *AB* 20 cm, *BC* 30 cm, *CD* 32 cm and *AD* 60 cm dimension, crank *AB* rotates at uniform speed of 300 r.p.m. in anticlockwise direction. When the crank *AB* has turned 60°, locate all the instantaneous centers and find the angular velocity of link *BC*.   5

(b) What is Coriolis acceleration component? In which cases does it occur? How is it determined?   5

4. How is the velocity ratio of epicyclic gear train obtained by tabular method? What the different forms of gear tooth?   8+2=10

5. *(a)* Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1·95 m part 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. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0·25?   5

(b) Derive the condition for transmitting the maximum power in a flat belt drive.   5

6. Two gears in mesh have module of 8 mm and a pressure angle of 20°. The larger gear has 57 teeth while the pinion has 23 teeth. If the addenda on pinion and gear wheels are equal to one module, find —

(a) the number of pairs of teeth in contact;

(b) the angle of action of the pinion and gear wheel;

(c) the ratio of sliding to rolling velocity at *(i)* the beginning of contact, *(ii)* the pitch point and *(iii)* the end of contact.   10

7. For a flat belt, prove that $T1 / T2 \quad e$, where $T1$ and $T2$ = tension in the tight and slack sides of the belt,   angle of contact between the belt and the pulley and   coefficient of friction between the belt and the pulley.   10

8. *(a)* Two gear wheels of 10 cm and 15 cm pitch diameter have involute teeth of 1·6 DP (Diametral Pitch) and pressure angle 20°. The addenda are 3 mm. Determine *(i)* length of path of contact, *(ii)* contact ratio, *(iii)* angle turned by pinion, while any pair of teeth is in contact.   7

(b) Explain the phenomena of 'Slip' and 'Creep' in a belt drive.   3

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