2018/EVEN/12/31/AE–402/283

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B.Tech Even Semester (CBCS) Exam., May—2018

AGRICULTURAL ENGINEERING

(4th Semester)

Course No. : AECC–12

(Kinematics 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. State Grashoff's criterion for the movability of a planar mechanism. Find all the inversions of the kinematic chain shown in Fig. 1. Indicate the type of each mechanism shown in Fig. 2*(a)*, *(b)*, *(c)* and *(d)* : 2+4+4=10

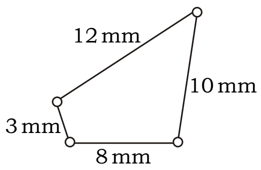

Fig. 1

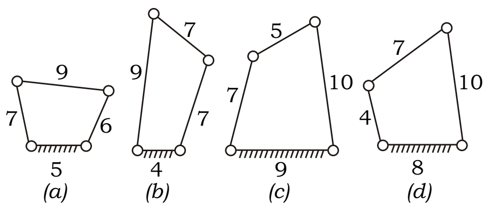

Fig. 2

2. Explain mechanical advantage of a planar mechanism. Determine the maximum and minimum transmission angle for the planar mechanisms shown in Fig. 3 : 1+9=10

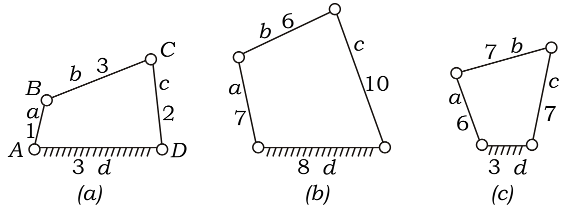

Fig. 3

3. Distinguish between locking and toggle of a mechanism. A planar 4-bar mechanism has a 70 mm fixed link, a 20 mm crank, a 50 mm coupler and a 70 mm follower. Locate the 2-toggle positions and find the corresponding crank angles and transmission angles. 4+6=10

4. Explain the working of crank and slotted lever mechanism with a neat sketch. Write its application. The length of fixed link of a crank and slotted lever mechanism is 250 mm and that of the crank is 100 m.

(a) Determine inclination of the slotted lever with vertical in the extreme positions.

(b) Determine the ratio of time of cutting stroke to the time of return stroke.

(c) Determine the length of stroke if the length of slotted lever is 450 mm and the line of stroke passes through the extreme positions of the free end of the lever.

(d) If the crank rotates at 210 r.p.m. and the length of link that connects the end of slotted lever to cutting tool is 300 mm, determine the velocity of cutting tool.

1+2+2+5=10

5. What is Coriolis acceleration component? In which cases does it occur? How is it determined? 2+2+6=10

6. What are coupler curves? Deduce the expression to draw the same in case of 4-bar mechanism and slider crank mechanism.

2+8=10

7. Derive the expression for the torque transmitted by the plate (disc) clutch based on uniform wear theory. A multiplate disc clutch transmits 55 kW of power at 1800 r.p.m. Coefficient of friction for the friction surfaces is 0·1. Axial intensity of pressure is not to exceed 160 kN/m^2. The internal radius is 80 mm and is 0·7 time the external radius. Find the number of plates needed to transmit the required power. 6+4=10

8. Write short notes on the following : 2½×4=10

(a) Gearbox

(b) Differential system

(c) Final drive

(d) Steering system

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