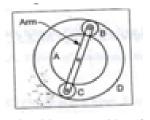# GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester – Regular) Examinations, June – 2021

BPCME4030 – Kinematics of Machinery

(Mechanical Engineering)

Time: 2 hrs   Maximum: 50 Marks

Answer ALL Questions
The figures in the right hand margin indicate marks.

PART – A: **(1 x 10 = 10 Marks)**

Q.1. Answer *ALL* questions   [CO#]   [PO#]

a. The number of degrees of freedom of a planer linkage with 8 links and 9 simple revolute joints is   CO1   PO 1

    (i)   1   (ii)   2
    (iii)   3   (iv)   4

b. Which of the following statements is incorrect   CO1   PO 1

(i) Grashof's rule states that for a planar crank-rocker four bar mechanism, the sum of the shortest and longest link lengths cannot be less than the sum of the remaining two link lengths.

(ii) Inversions of a mechanism are created by fixing different links one at a time.

(iii) Geneva mechanism is an intermittent motion device.

(iv) Gruebler's criterion assumes mobality of a planar mechanism to be one.

c. Scotch yoke mechanism is used to generate   CO1   PO 1

    (i)Sine functions   (ii)square roots
    (iii) logarithms   (iv)inversions

d. In a crank and slotted lever quick-return motion, the distance between the fixed centres is 150 mm and the length of the driving crank is 75mm. the ratio of the time taken on the cutting and return strokes is   CO1   PO 1

    (i)1.5   (ii)2
    (iii)2.2   (iv)2.93

e. There are two points P and Q on a planar rigid body. The relative velocity between the two points   CO1   PO 1

(i) should always be along PQ

(ii) can be oriented along any direction

(iii) should always be perpendicular to PQ

(iv) should be along QP when the body undergoes pure translation

f. Instantaneous center of rotation of a link in a four bar mechanism lies on   CO2   PO 1

(i) right side pivot of this link

(ii) left side pivot of this link

(iii) a point obtained by intersection on extending adjoining links

(iv)none of these

g. The coriolis component of acceleration exists whenever a point moves along a path that has   CO2   PO 1

(i) linear displacement

(ii) rotational motion

(iii) gravitational acceleration

(iv) tangential acceleration

h. The synthesis of mechanism deals with   CO3   PO 1

(i)the determination of input and output angles of a mechanism

(ii)the determination of dimensions of the links in a mechanism

(iii)determination of velocity displacement, acceleration of the links in a mechanism

(v) None of the above

i. The types of gears used to connect two non-parallel non-intersecting shafts are _____   CO4   PO 1
    gears.
    (i)spur   (ii)helical
    (iii)bevel   (iv)spiral

j. The train value of a gear train is _____.   CO4   PO 1
    (i) equal to velocity ratio of a gear train   (ii) reciprocal of velocity ratio of a gear train
    (iii) always greater than unity   (iv) always lesser than unity

PART – B: **(2 x 5 = 10 Marks)**

Q.2. Answer *ALL* questions   [CO#]   [PO#]

		Marks	[CO#]	[PO#]
a.	Define the transmission angle related to the four bar chain		CO1	PO 1
b.	Explain the rubbing velocity in pin joints, and write down the expression for the same		CO1	PO 1
c.	State the reason for performing velocity and acceleration analysis		CO2	PO 1
d.	Explain the Simple Harmonic Motion (SHM) of a follower with a sketch		CO3	PO 1
e.	Define gear tooth system		CO4	PO 1

PART – C: **(6 x 5 = 30 Marks)**

Answer *ANY FIVE* questions   Marks   [CO#]   [PO#]

		Marks	[CO#]	[PO#]
3.	Explain the various inversions of a double slider crank chain with suitable diagrams	(6)	CO1	PO 1
4.	Explain any four types of lower pair	(6)	CO1	PO 1
5.	In a pin jointed four bar mechanism ABCD, the lengths of various links are as follows AB= 25 mm; BC = 87.5 mm; CD = 50 mm and AD = 80 mm. The link AD is fixed and angle BAD = 135^0. If the velocity of B is 1.8 m/s in the clockwise direction and find 1. Velocity and acceleration of the midpoint of BC and 2) angular velocity and angular acceleration of the link CB and CD	(6)	CO2	PO 2
6.	Draw a neat sketch of crank and slotted lever quick return mechanism a derive the expression for time ratio and length of the stroke	(6)	CO2	PO 1
7.	Discuss the method of determining the angles for input and output link in a four bar mechanism for function generation	(6)	CO3	PO 1
8.	Design a cam to raise a valve with simple harmonic motion through 50 mm in 1/3 of a revolution keep it fully raised through 1/12 revolution and to lower it with simple harmonic motion in 1/6 revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 20 mm and the minimum radius of the cam is 25 mm. The diameter of the cam shaft is 25 mm. The axis of the valve rod passes through the axis of the cam shaft. If the cam shaft rotates at uniform speed of 100 rpm find the maximum velocity and acceleration of a valve during raising and lowering	(6)	CO3	PO 2
9.	Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm, and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, find (i) the angle turned through by pinion when one pair of teeth is in mesh; and (ii) the maximum velocity of sliding.	(6)	CO4	PO 2

10. An epicyclic gear train shown in figure below. (6) CO4 PO 2

The internal gear D has 90 teeth and the sun gear A has 40 teeth. The two planet gears B & C are identical and they are attached to an arm as shown. How many revolutions does the arm makes When 'A' makes one revolution in clockwise and 'D', makes half revolution in anticlockwise and 'D' makes 1⁄2 revolutions in opposite sense. (ii) When 'A' makes one revolution in clockwise and 'D' remains stationary

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