KUMARAGURU
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Register Number:…….

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Third Semester

MECHATRONICS ENGINEERING

U13MCT302**:** Kinematics Of Machinery

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. In a kinematic chain a ternary joint is equivalent to

   a) One binary joint b) Three binary joint

   c) Two binary joint d) Six binary joint

2. Transmission angle is maximum when crank angle with fixed link is ……..

3. Coriolis acceleration component is taken into account for the mechanism

   a) Double slider crank b) Scotch yoke

   c) Four-link mechanism d) Crank and slotted –lever quick return mechanism

4. The number of coupler curves which can be drawn in a mechanism can be ……..

5. The cam follower used in automobile engine is

   a) Roller b) Spherical –faced

   c) Flat-faced d) Knife-edged

6. The size of the cam depends on ……..

7. Two parallel shafts can be connected by

   a) Straight spur gear b) Cross-helical gear

   c) Spiral gear d) Straight- bevel gear

8. The path of contact in an involute tooth profile is ……..

9. The efficiency of screw jack depends on

   a) Pitch of threads
   b) Both pitch and load
   c) Load
   d) Neither pitch nor load

10. For a safe design, a friction clutch is designed, assuming that ……..

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. Classify the various types of links to connect driver and follower.

12. Show the single slider crank chain mechanism.

13. Illustrate Kennedy□s theorem.

14. Illustrate the coupler curve.

15. List the various types of cam.

16. Define pitch circle.

17. State law of gearing.

18. What are the common forms of teeth?

19. Compare the ball and roller bearing.

20. List the various types of friction clutches.

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. A crank rocker mechanism has a 70 mm fixed link, a 20 mm crank, a 50 mm coupler, and a 70 mm rocker. Using the above data draw the mechanism and determine the maximum and minimum values of the transmission angle. Locate the two toggle positions and find the corresponding crank angles and transmission angles.

22. a) In a slider crank mechanism, the length of the crank OB and connecting rod AB are 125 mm and 500 mm respectively. The centre of gravity G of the connecting

rod is 275 mm from the slider A. The speed of the crank is 600 r.p.m clockwise, when the crank turns 45˚ from the inner dead centre position. Apply the above data and determine 1.velocity of the slider A, 2.velocity of point G, 3. Angular velocity of the connecting rod AB.

(OR)

b) In a four-link mechanism, the crank AB rotates at 36 rad/s. The length of the links are AB=200 mm,BC=40 mm,CD=450 mm and AD=600 mm. AD is the fixed link. The line AB is at right angles to AD using. Apply the above data determine the velocity of

1. The midpoint of link BC
2. A point on the link CD, 100 mm from the pin connecting the links CD and AD.

23. a) Develop the profile of a cam operating a knife edge follower having a lift of 30 mm. The cam raises the follower with SHM for 150˚ of the rotation followed by a period of dwell for 60˚. The follower descends for the next 100˚ rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at a uniform velocity of 120 r.p.m and has a least radius of 20 mm. Apply the above data and find the maximum velocity and acceleration of the follower during the lift and return?

(OR)

b) Draw a profile of a cam operating a roller reciprocating follower by applying the following data. Minimum radius of the cam = 25 mm, lift = 30 mm, roller diameter= 15mm. The cam lifts the follower for 120˚ with SHM followed by a dwell period of 30˚.Then the follower lowers down during 150˚ of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150 r.p.m, calculate the maximum velocity and acceleration of the follower during the descend period.

24. a) The centre distance between two spur gears in a mesh is to be approximately 275 mm. The gear ratio is 10 to 1. The pinion transmits 360 kw at 1800 r.p.m. The pressure angle of the involute teeth is 20˚ and the addendum is equal to one module. The limiting value of normal tooth pressure is 1 KN/mm of width.

Apply the above data and determine the 1. Nearest standard module so that interference does not occur 2. Number of teeth on each gear wheel, and 3. Width of pinion.

(OR)

b) An epicyclic gear train shown in figure (1) consists of an arm and two gears A and B having 30 and 40 teeth respectively. The arm rotates about the centre of the gear A at a speed of 80 r.p.m counterclockwise. Apply the above data and determine the speed of the gear B if 1. Gear A is fixed and 2. Gear A revolves at 240 rpm clockwise instead of being fixed.

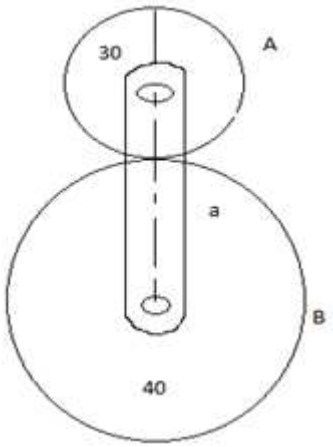

Figure-1

25. a) A load of 15 kN is raised by means of screw jack. The mean diameter of the square threaded screw is 42 mm and pitch is 10 mm. A force of 120 N is applied at the end of a lever to raise the load. Apply the above data and determine the length of the lever to be used and the mechanical advantage obtained. Is the screw self locking? Take $\mu = 0.12$.

(OR)

b) A casting weighing 9 KN hangs freely from a rope which makes 2.5 turns round a drum of 300 mm diameter revolving at 20 r.p.m. The other end of the rope is pulled by a man. The coefficient of friction is 0.25. Apply the above data and determine 1. Force required by a man and 2. The power to raise the casting.

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