

B.TECH DEGREE EXAMINATIONS: NOV / DEC 2014

(Regulation 2009)

Fourth Semester

TEXTILE TECHNOLOGY

MEC202: Theory of Machines

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. A kinematic chain is known as a mechanism when
 - a) None of the link is fixed
 - b) one of the link is fixed
 - c) two of the link is fixed
 - d) All of the link is fixed
2. The grubler's criterion for determining the degree of freedom (n) of a mechanism having plane motion is _____, where L-number of links, j- number of binary joints.
 - a) $n=(L-1)-j$
 - b) $n=2(L-1)-2j$
 - c) $n=3(L-1)-2j$
 - d) $n=4(L-1)-3j$
3. Offset is provided to a cam follower mechanism to
 - a) Minimize the side thrust
 - b) accelerate
 - c) Avoid jerk
 - d) retardate
4. The cam follower generally used in automobile engine is
 - a) Knife edge follower
 - b) Flat faced follower
 - c) Spherical faced follower
 - d) roller follower
5. The portion of the path of contact from the beginning of the engagement to the pitch point is termed as
 - a) Arc of approach
 - b) Path of approach
 - c) Arc of recess
 - d) Path of recess
6. The product of diameter pitch and circular pitch is equal to
 - a) 1
 - b) $1/\pi$
 - c) π
 - d) 2π
7. The train value of a gear train is
 - a) Equal to velocity ratio of a gear train
 - b) Reciprocal of velocity ratio of a gear train
 - c) Always greater than one
 - d) Always less than one
8. In an internal gearing the motion of the two wheels is always
 - a) like
 - b) unlike
 - c) inclined
 - d) curved
9. The centrifugal tension in belts
 - a) Increases power transmitted
 - b) Decreases power transmitted
 - c) Have no effect on the power transmitted
 - d) Increase power transmitted upto a certain speed and then decreases

10. The friction torque transmitted by a disc or plate clutch is same as that of
- a) Flat pivot bearing
 - b) Flat pivot bearing
 - c) Conical pivot bearing
 - d) Trapezoidal pivot bearing

PART B (10 x 2 = 20 Marks)

- 11. Define Grashoff's law.
- 12. Compare machine and structure.
- 13. What you know about undercutting in cam?
- 14. What is meant by circular arc cam?
- 15. Define law of gearing.
- 16. List out the methods to avoid interference.
- 17. Write short notes on reverted gear train.
- 18. What are the three externally applied torques in epicyclic gear train?
- 19. Explain the working of single plate clutch.
- 20. When Self locking of brake occurs?

PART C (5 x 14 = 70 Marks)

21. a) Sketch and describe the working of two different types of quick return mechanism .Give examples of their applications. Drive an expression for the ratio of times taken in forward and return stroke.
- (OR)**
- b) (i) Explain the following mechanism (7)
- a) Peaucellier mechanism.
 - b) Grasshoppers mechanism.
- (ii) Define transmission angle. Discuss the effect of transmission angle on (7) mechanical advantage.
22. a) Design a cam for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration and retardation during opening and closing of the valve each of which corresponds to 60° of cam rotation. The valve must remain in the fully open position for 20° of cam rotation.
- The lift of the valve is 37.5mm and least radius of the cam is 40mm.The follower is provided with a roller of radius 20mm and its line of stroke passes through the axis of the cam.
- (OR)**
- b) In a symmetrical tangent cam operating a roller follower, the least radius of the cam is 30mm and roller radius is 17.5 mm. The angle of ascent is 75° and total

lift is 17.5mm. The speed of cam shaft is 600rpm. Calculate

- (i) Principle dimensions of cam
- (ii) Acceleration of the follower at the beginning of the lift, where straight flank merges into the circular nose and at the apex of the circular nose. Assume that there is no dwell between ascent and descent

23. a) Drive an expression for the length of the path of contact in a pair of meshed spur gear.

(OR)

b) Two gear wheels mesh externally to give a velocity ratio of 3 to 1. The involute teeth have 6mm module and 20° pressure angle. Addendum is equal to one module. The pinion rotates at 90 rpm. Determine

- (i) number of teeth on pinion to avoid interference and the corresponding number on the wheel
- (ii) the length of path and arc of contact
- (iii) contact ratio
- (iv) the maximum velocity of sliding

24. a) In an epicyclic gear train, as shown in Fig 1 the internal wheel A and B and compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. E gears with A and C and F gears with B and D. All the wheels have the same module and the number of teeth are $T_C=28$, $T_D=26$, $T_E=T_F=18$.

- (i) Find the number of teeth on A and B
- (ii) If the arm G makes 100rpm clockwise and A is fixed, find the speed of B
- (iii) If the arm G makes 100rpm clockwise and A makes 10rpm counter clockwise, find the speed of wheel B

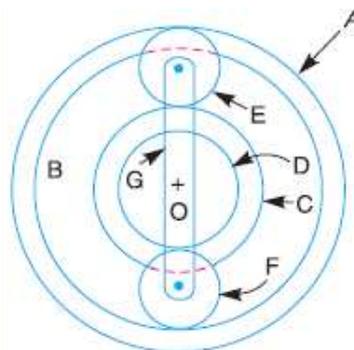


Fig 1

(OR)

- b) An epicyclic gear train shown in Fig 2 consists of a sun wheel S, a stationary internal gear E and three identical planet wheels P carried on a star shaped planet carrier C. The size of different toothed wheels are such that the planet carrier C rotates at $\frac{1}{5}$ th of the speed of the sun wheel S. The minimum number of teeth on any wheel is 16. The driving torque on the sun wheel is 100Nm. Determine (i) number of teeth on different wheels of the train
(ii) torque necessary to keep the internal gear stationary

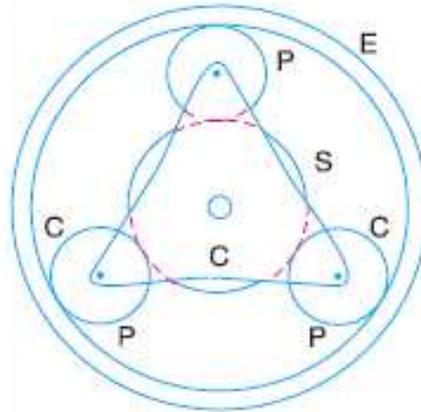


Fig 2

25. a) Determine the width of a 9.75 mm thick leather belt required to transmit 15 kW from a motor running at 900rpm. The diameter of the driving pulley of the motor is 300mm. The driven pulley runs at 300rpm and distance and the distance between the center of two pulley is 3m. The density of the leather is 1000 kg/m^3 . The maximum allowable stress in the leather is 2.5 MPa. The coefficient of friction between the leather and the pulley is 0.3. Assume open belt drive and neglect the sag and slip of belt.

(OR)

- b) A plate clutch has three disc on the driving shaft and two discs on the driven shaft, providing four pairs of contact surfaces. The outside diameter of the contact surface is 240mm and inside diameter 120mm. Assuming uniform pressure and $\mu=0.3$, find the total spring load pressing the plates together to transmit 25KW at 1575 rpm.
If there are 6 springs each of stiffness 13 kN/m and each of contact surfaces has worn away by 1.25mm, find the maximum power that can be transmitted, assuming uniform wear.
