Register Number: .....

B.TECH DEGREE EXAMINATIONS: APRIL / MAY 2010

Third Semester

TEXTILE TECHNOLOGY

U07TT302: Theory of Machines

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

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. A chain does not allow any motion of a link relative to the other is known as

   a) four bar chain b) redundant chain c) six bar chain d) composite chain

2. Inversion of a mechanism is to obtain different mechanisms in a kinematic chain

   a) by fixing different chains b) by fixing different pairs

   c) by fixing different machines d) by fixing different links

3. Which one of the following angle is the angle between the normal to the pitch curve at a point and the direction of the follower motion?

   a) angle of dwell b) angle of action c) pressure angle d) angle of ascent

4. Which one of the following does not pose the problem of jamming the cam?

   a) mushroom follower b) flat faced follower c) roller follower d) knife edge follower

5. In involute gears, mating of two non conjugate (non involute) teeth is known as

   a) interference b) backlash c) space width d) face width

6. In Gears, the difference between the space width and the tooth thickness along the pitch circle is known as

   a) interference b) backlash c) space width d) fa¿e width

7. The conditions for maximum power transmitted by a belt are

   a) $T_C = 3T$ and $V = (3T / m)^{1/2}$ b) $T = 3T_C$ and $V = (T / 3m)^{1/2}$

   c) $T_C = 3T$ and $V = (T / 3m)^{1/2}$ d) $T = 3T_C$ and $V = (3T / m)^{1/2}$

   where T_C – centrifugal tension

   T – total tight side tension

   V – velocity of the belt and m - mass of the belt

8. For the self locking screws, which one of the following condition is applicable?

   a) $\Phi \geq \alpha$ or $\alpha \leq \Phi$ b) $\Phi = \alpha$ or $\alpha < \Phi$ c) $\Phi \leq \alpha$ or $\alpha \geq \Phi$ d) $\Phi > \alpha$ or $\alpha = \Phi$

   Where Φ – angle of friction

   α – helix angle

9. In Vibration, the number of independent coordinates required to describe a vibratory system is known as its

   a) frequency b) degrees of freedom c) resonance d) cycle

10. When no external force acts on the body after giving it an initial displacement, then the body is said to be under

a) forced vibration b) free vibration c) damped vibration d) viscous damping

PART B (10 x 2 = 20 Marks)

11. Define: Degrees of freedom of a pair.
12. Define: Kutzback Criterian.?
13. What is tangent cam?
14. What is circular arc cam?
15. Define: Pitch point in gears.
16. Define: Angle of obliquity in gears.
17. What are the classifications of chains?
18. What is a Self locking screw?
19. Define: Degrees of freedom in vibration.
20. Define: Critical speed of a shaft in vibration.

PART C (5 x 14 = 70 marks)

21. a) (i) Explain the working principles of the Whitworth Quick Return Mechanism with a neat sketch. (10)

(ii) Explain the working principles of the Scotch yoke mechanism with a neat sketch. (4)

(OR)

b) (i) Explain the working principle of the Crank and Slotted lever Quick return Mechanism with a neat sketch. (10)

(ii) Explain the working principle of the Indexing mechanism with a neat sketch. (4)

22. a) Draw the profile of a Cam operating a roller reciprocating follower and with the following data. Minimum radius of the cam is 25 mm, Lift is 30 mm and Roller diameter is 15 mm. The cam lifts the follower for 120° with Simple Harmonic Motion 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 rpm, calculate the maximum velocity and acceleration of the follower during the ascent and descent period.

(OR)

b) The following data relate to a cam operating an Oscillating Roller follower Minimum diameter of a cam is 44 mm, Diameter of the roller is 14 mm, Length of the follower arm is 40 mm, Distance of fulcrum centre from cam centre is 50 mm, angle of assent is 75°, angle of dwell for the follower in the highest position is 60°, angle of descent is 105° followed by a dwell period and angle of oscillation of follower is 28°.

The raising of the follower takes place with Cycloidal motion and the lowering with Uniform Acceleration and Deceleration. Draw the profile of the cam. Calculate the maximum velocity and acceleration of the follower during the ascent and descent period. Also draw the velocity and acceleration diagram when the speed of the cam is 200 rpm.

23. a) (i) Derive an expression for the Law of Gearing. (7)

(ii) The following data relates to two meshing gears. Velocity ratio is 1/3, module is 4 mm, pressure angle is 20^0, centre distance is 200 mm and the driven gear rotates at 300 rpm. Determine the number of teeth and the base circle radius of the gear wheel. What will be the pitch line velocities? (7)

(OR)

b) (i) Write short notes on the following terms related to gear

1. helix angle of helical gear
2. circular Pitch of helical gear
3. lead angle of worm gear
4. efficiency of worm gear (8)

(ii) A pair of bevel gears is mounted on two intersecting shafts whose shaft angle is 72^0. The velocity ratio of the gears is 2. Find the pitch angles. (6)

24. a) (i) 2.5 kW of power is transmitted by an Open belt drive. The linear velocity of the belt is 2.5 m/s. The angle of lap on the smaller pulley is 165^0. The co-efficient of friction is 0.3. Determine the effect on power transmission in the following cases.

1. initial tension in the belt is increased by 8% and
2. co-efficient of friction is increased by 8% by suitable dressing to the friction surface of the belt. (8)

(ii) A Centrifugal clutch transmits 20 kW of power at 750 rpm. The engagement of the clutch commences at 70% of the running speed. The inside diameter of the drum is 200 mm and the distance of the centre of mass of each shoe is 40 mm from the contact surface. Determine the mass of the each shoe and the net force exerted by each shoe on the drum surface. Assume the coefficient of friction is 0.25 (6)

(OR)

b) (i) Derive an expression to find the length of Open Belt drive. (8)

(ii) A multiplate disc clutch transmits 55 kW of power at 1800 rpm. Axial intensity of pressure is not to exceed 160 kN/m^2. The internal radius is 80 mm and is 0.7 times the external radius. Find the number of plates needed to transmit the required torque. Assume the coefficient of friction is 0.1 (6)

25. a) (i) Determine the equivalent spring stiffness and the natural frequency of the following vibrating systems when 1. the mass is suspended to a spring (refer figure a) 2. the mass is suspended at the bottom of two springs in series (refer figure b) 3. the mass is fixed in between two springs (refer figure c). Take $s_1 = 5$ N/mm, $s_2 = 8$ N/mm and m = 10 kg. (8)

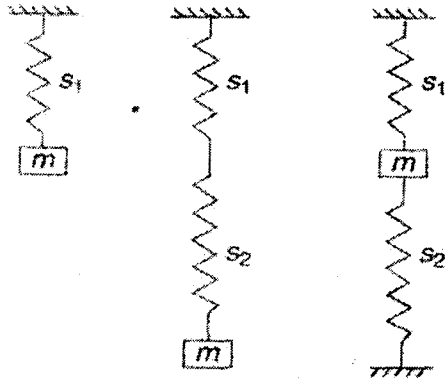

figure (a) figure (b) figure (c)

(ii) What is the condition for the following damping?

1. critical damping
2. under damping
3. over damping (6)

(OR)

b) (i) Define the following terms of Vibration

1. damped vibration
2. transverse vibration
3. resonance
4. D'Alemberts Principle (8)

(ii) What are the different methods to find the natural frequency of a vibrating system? Explain any one of the methods. (6)