Register Number.....

B.TECH DEGREE EXAMINATIONS: APRIL / MAY 2009

Third Semester

TEXTILE TECHNOLOGY

U07TT302 Theory of Machines

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

Answer ALL the Questions:-

PART A (20 x 1 = 20 Marks)

1. Which one of the following is an example, of the inversion of slider crank chain?

   a) scotch yoke mechanism b) elliptical Trammel
   c) rotary engine d) oldham's coupling

2. For a Superstructure, the value of degree of freedom is

   a) 2 b) negative c) 3 d) 1

3. When all member of pairs having one degree of freedom, then which one of the following is the Grubler's criterion for degrees of freedom of plane mechanism?

   a) F = 3 (N-1) - 2p b) F = 3 (N-1) - 3p
   c) F = 2 (N-1) -2p d) F = 2 (N-1) - 3p

   where F – degrees of freedom
   N – total number of links in a mechanism
   p - number of pairs having one degree of freedom

4. In a four pair mechanism, the link opposite to the fixed link is called as a

   a) rocker b) crank c) bar d) coupler

5. 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

6. What is the name of the circle, which is the smallest circl drawn tangent to the pitch curve?

   a) pitch circle b) base circle c) prime circle d) pitch curve

7. For cycloidal motion of the cam, which one of the following formula is used to calculate the maximum acceleration?

   a) $4\omega^2 h / \varphi^2$ b) $2\pi\omega^2 h / \varphi^2$ c) $\pi^2\omega^2 h / 2\varphi^2$ d) $2\pi^2\omega^2 h / \varphi^2$

   where ω – angular velocity
   h – maximum follower displacement
   φ - cam rotation angle for the maximum follower displacement

8. In Cam, jerk is

   a) rate of change of velocity b) rate of change of displacement
   c) rate of change of momentum d) rate of change of acceleration

9. In Gears, which one of the following is the difference between the space width and the tooth thickness along the pitch circle?

   a) clearance b) backlash c) face width d) addendum

10. In Gears, which one of the following is the ratio of the pitch diameter to the number of teeth?

    a) module b) Gear ratio c) backlash d) velocity ratio

11. In Gears, a position of the pinion's dedendum falls inside the base circle is called

a) interference b) backlash c) undercutting d) clearance

12. In Gears, which one of the following is the angle between the pressure line and the common tangent to the pitch circle?

a) angle of obliquity b) angle of action c) angle of clearance d) angle of pitch

13. 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 m - mass of the belt

14. Which one of the following pulley is used to increase the velocity ratio?

a) guide pulley b) loose and fast pulley
c) intermediate pulley d) idler pulley

15. Which one of the following drive will give the constant velocity ratio?

a) flat belt drive b) V belt drive c) rope drive d) chain drive

16. In friction, the ratio of the weight lifted (W) to force applied (F) is called as

a) selflocking b) velocity ratio
c) efficiency d) mechanical advantage

17. 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

18. When the energy of the vibrating system is gradually dissipated by friction and other resistances the vibration are said to be

a) forced vibration b) free vibration c) damped vibration d) natural vibration

19. In Vibration, the number of cycles of motion completed in one second is called as

a) frequency b) cycle c) period d) resonance

20. Which one of the following is the critical damping co-efficient?

a) $C_C = 2 (sm)^{1/2}$ b) $C_C = 4 (sm)^{1/2}$
c) $C_C = 3 (sm)^{1/2}$ d) $C_C = (sm)^{1/2}$

where C_C – critical damping co-efficient

s – stiffness of the spring m - mass of the spring

PART B (5 x 16 = 80 Marks)

21.a) i) Explain the working principles of the Crank and Slotted lever Quick return Mechanism with neat sketches. (12)

ii) Explain the working principles of the Oscillating cylinder Engine with neat sketches. (4)

(OR)

b) i) Explain the working principle of the Whitworth Quick Return Mechanism with neat sketches. (12)

ii) Explain the working principle of the Rotary Engine with neat sketches. (4)

22. a) i) 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 descent period. (12)

ii) Write the formula to calculate the acceleration of the roller follower with tangent cam for the following cases.

1. When the follower at the beginning of lift
2. When the follower at a apex of the circular nose. (4)

(OR)

b) i) 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 the fulcrum centre from cam centre is 50 mm, Angle of assent is 75°, Angle of descent is 105°, Angle of dwell for the follower in the highest position 60° and angle of oscillation of follower 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 if the ascent and descent (12)

ii) Write the formula to calculate the acceleration of the flat faced follower with circular arc cam for the following cases.

i.when the follower at the beginning of lift

ii.when the follower at a apex of the circular nose. (4)

23. a) i) Derive an expression for the Law of Gearing (8)

ii) A two start worm rotating at 800 rpm drives a 26 tooth worm gear. The worm has a pitch diameter of 54 mm and a pitch of 18 mm. If a co-efficient of friction is 0.06, find

ii)

1. the helix angle of worm
2. the centre distance
3. the lead angle for maximum efficiency
4. the maximum efficiency (8)

(OR)

b) i) The centre distance between two meshing helical gears is 260 mm and the angle between the shafts 65^0. The normal circular pitch is 14 mm and the gear ratio 2.5. The driven gear has a helix angle of 35^0. Find (8)

1. the number of teeth on each wheel
2. the exact centre distance
3. the efficiency, assuming the friction angle to be 5.5^0.

ii) Explain the following terms of Worm and Worm Gear. (8)

1. axial pitch 2.lead 3. velocity ratio 4.efficiency

24. a) i) Derive an expression to find the length of Open Belt drive. (10)

ii) A pulley used to transmit power by means of ropes has a diameter of 3.6 m and 15 grooves (45^0 angle. The angle of contact is 170^0 and the co-efficient of friction between the ropes ar the grooves sides is 0.28. The maximum possible tension in the ropes is 960 N and the mass (the rope is 1.5 kg per metre length. What is the speed of pulley in rpm and the pow transmitted if the condition of maximum power prevail? (6)

(OR)

Time: 1

b) i) 2.5 kW of power is transmitted by an Open belt drive. The linear velocity of the belt is 2 m/s. The angle of lap on the smaller pulley is 165^0. The co-efficient of friction is 0. Determine the effect on power transmission in the following cases.

1. initial tension in the belt is increased by 8 %
2. angle of lap is increased by 8% by the use of an idler pulley, for the same speed an the tension on the tight side and
3. co-efficient of friction is increased by 8% by suitable dressing to the friction surfac of the belt. (12)

ii) A Cone clutch with a semi cone angle of 15^0 transmits 10 kW at 600 rpm. The norma pressure intensity between the surfaces in contact is not to exceed100 kN/m^2. The width c the friction surfaces is half of the mean diameter. Assume the co-efficient of friction is 0.2 Determine the outer and inner diameter of the plate (4)

25. a) i) Define the following terms of Vibration

1. Forced vibration 2. Period 3. Cycle
4. Resonance 5. Critical speed (10)

ii) Determine the equivalent spring stiffness and the natural frequency of the following vibrating systems of mass 10 kg when

1. the mass is suspended to a spring, take stiffness of the spring is 5 N/mm
2. the mass is suspended at the bottom of two springs in series, take stiffness of the spring 1 is 5 N/mm and spring 2 is 8 N/mm. (6)

(OR)

b) i) What are the different methods to find the natural frequency of a vibrating system? Explain the methods. (13)

ii) What is the condition for the following damping?

1.critical 2. underdamped 3.overdamped (3)

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