

**B.TECH. DEGREE EXAMINATIONS, OCTOBER / NOVEMBER – 2008**

Third Semester

**TEXTILE TECHNOLOGY****U07TT302 Theory of Machines****Time: Three Hours****Maximum Marks: 100****Answer ALL Questions: -****PART A (20 X 1 = 20 Marks)**

1. A Kinematics pair is a joint of
  - a. Two links which are fixed
  - b. Two links having same velocity
  - c. Two links having relative motion between them
  - d. Two links having same degrees of freedom
2. A ball and a socket joint forms a
  - a. Turning pair
  - b. Rolling pair
  - c. Sliding pair
  - d. Spherical pair
3. Choose the wrong statement
  - a. A chain consisting of three links and three joints is known as locked joint
  - b. A chain consisting of four links with four joints is known as kinematic pair
  - c. Quaternary joint is equivalent to three binary joints
  - d. Rectangular bar in a rectangular hole is the example of partially constrained motion.
4. Oldham's coupling and elliptical trammels are the inversion of
  - a. Four bar chain
  - b. Single slider crank chain
  - c. Double slider crank chain
  - d. Crossed slider crank chain
5. Offset is provided to a cam follower mechanism to
  - a. Minimize the slide thrust
  - b. Accelerate
  - c. Avoid jerk
  - d. Minimize the friction
6. The size of the cam depends on
  - a. Base circle
  - b. Pitch circle
  - c. Prime circle
  - d. Pitch curve
7. For high speed engines, the cam follower should move
  - a. Uniform velocity
  - b. Simple harmonic motion
  - c. Cycloidal motion
  - d. Parabolic motion
8. Which statement is true related to tangent cam
  - a. It is symmetrical about the center line
  - b. It is un symmetrical about center line
  - c. It is coincides with the follower by straight line
  - d. It is collinear with the follower
9. For no slip between the two gears, the tangential velocity at the contact surfaces are
  - a. Not same
  - b. Same
  - c. Twice the velocity of the first gear
  - d. Square root of the velocity of the first gear

10. Diametral pitch is given by the formula  
 a.  $\pi D/T$       b.  $T/D$       c.  $D/2T$       d.  $T/m$
11. Interference can be avoided in involute gears with  $20^\circ$  pressure angle by  
 a. Cutting involute correctly      b. Using more than 20 teeth  
 c. Using more than 8 teeth      d. Using as small number of teeth as possible
12. Miter gears are used for  
 a. Great speed reduction      b. Minimum axial thrust  
 c. Minimum backlash      d. Equal speed
13. The power transmitted by a belt is maximum when the maximum tension in the belt (T) is equal to  
 a.  $T_c$       b.  $2T_c$       c.  $3T_c$       d.  $\sqrt{3} T_c$  where  $T_c$  is centrifugal tension
14. The relation between the pitch of the chain (p) and pitch circle diameter of sprocket (d) is given by  
 a.  $p = d \sin\left(\frac{90^\circ}{T}\right)$   
 b.  $p = d \sin\left(\frac{90^\circ}{T}\right)$   
 c.  $p = d \sin\left(\frac{120^\circ}{T}\right)$   
 d.  $p = d \sin\left(\frac{180^\circ}{T}\right)$       Where T is Number of teeth on sprocket wheel
15. The frictional torque transmitted in a conical clutch, considering uniform wear is  
 a.  $1/2 \mu WR \operatorname{cosec} \alpha$   
 b.  $2/3 \mu WR \operatorname{cosec} \alpha$   
 c.  $3/4 \mu WR \operatorname{cosec} \alpha$   
 d.  $\mu WR \operatorname{cosec} \alpha$
16. In single plate clutch the maximum pressure is at  
 a. Outer radius      b. Inner radius      c. At mean radius      d. Both inner and outer radius
17. When there is a reduction in amplitude over every cycle of vibration, then the body is said to be  
 a. Free vibration      b. Damped vibration      c. Force vibration      d. Steady vibration
18. The factor which affects the critical speed of a shaft is  
 a. Eccentricity      b. Span of the shaft  
 c. Eccentricity      d. All of the above
19. The roots of the differential equation of a free damped vibration is zero then it is called as  
 a. Over damping  
 b. Under damping  
 c. Critical damping  
 d. Forced damping
20. The ratio of the maximum displacement of the forced vibration to the deflection due to the static force is known as  
 a. Damping factor      b. Logarithmic decrement  
 c. Magnification factor      d. Damping factor

PART-B (5 X 16 =80 Marks)

21 a) Explain with neat sketch the inversions of double slider crank. (16)

(OR)

(b) (i) What are the classifications of mechanisms? (4)

(ii) Explain various indexing mechanisms with neat sketches. (12)

22 a) The following data are for a disc cam mechanism with roller follower:

Minimum radius of the cam = 35 mm

Lift of the follower = 40 mm

Offset of the follower = 15 mm

Roller diameter = 15 mm

Cam rotation angles are as mentioned below:

During ascent =  $120^\circ$ , Dwell =  $80^\circ$ , During descent =  $80^\circ$ , Dwell =  $80^\circ$

Cam rotates in clockwise direction and the follower motion is simple harmonic during ascent and descent.

(i) Draw the displacement diagram of the follower and indicate the relevant data

(ii) Draw the cam profile and indicate the relevant data (16)

(OR)

(b) A tangent cam with a base circle diameter of 50 mm operates a roller follower 20 mm in diameter. The line of stroke of the roller follower passes through the axis of the cam. The angle between the tangential faces of the cam is  $60^\circ$ , speed of the cam shaft 200 rpm and the lift of the follower 15 mm. Calculate

1. the main dimensions of the cam

2. the acceleration of the follower at

(i) the beginning of the lift

(ii) Where the roller just touches the nose

(iii) The apex of the circular nose. (16)

23 (a) Two involutes gears of  $20^\circ$  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/sec, 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 (16)

(OR)

(b) A pair of involutes spur gears with  $16^\circ$  pressure angle and pitch of module 6 mm is in mesh. The number of teeth on pinion is 16 and its interference is just avoided. Determine

- (i) The addendum on pinion and gear wheel
- (ii) The length of path of contact and
- (iii) The maximum velocity of sliding of teeth on either side of the pitch point (16)

24 (a) (i) For flat belt drive, prove that  $\frac{T_1}{T_2} = e^{\mu\theta}$ ,

where  $T_1$  Tension on the tight side of the belt.

$T_2$  tension on the slack side of the belt.

$\mu$  Coefficient of friction between the belt and pulley.

$\theta$  angle of contact between the belt and the pulley (8)

(ii) A rope drive transmits 600 kW from a pulley of effective diameter 4 m which runs at a speed of 90 rpm. The angle of lap is  $160^\circ$  the angle of groove  $45^\circ$ . The coefficient of friction is 0.28. The mass of the rope 1.5 kg/m. and allowable tension is each rope 2400 N. Find the number of ropes required. (8)

(OR)

(b) A single dry plate clutch transmits 7.5 kW at 900 rpm. The axial pressure is limited to  $0.07 \text{ N/mm}^2$ . If the coefficient of friction is 0.25, find

(i) Mean radius and face width of the friction lining assuming the ratio of the mean radius to face width as 4, and

(ii) Outer and inner radii of the clutch plate (16)

25 (a) A body of mass 20 kg is suspended from a spring, which deflects 15 mm under this load. Calculate the frequency of free vibrations and verify that a viscous damping of  $1000 \text{ N/m/s}$  at is just sufficient to make the motion aperiodic. If when damped to this extent, the body is subjected to a disturbing force with a maximum value of 125 N making 8 cycles /sec. find the amplitude of the ultimate motion. (16)

(OR)

(b) A shaft 1.5 m long, supported in flexible bearings at the ends carries two wheels each of 50 kg mass. One wheel is situated at the center of the shaft and the other at a distance of 375 mm from the center towards left. The shaft is hollow of external diameter 75 mm and internal diameter 40 mm. The density of the shaft material is  $7700 \text{ kg/m}^3$  and its modulus of elasticity is  $200 \text{ GN/m}^2$ . Find the lowest whirling speed of the shaft, taking into account the mass of the shaft. (16)

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