Register Number: ……..

B.TECH DEGREE EXAMINATIONS: APRIL/MAY 2014

(Regulation 2009)

Sixth Semester

TEXTILE TECHNOLOGY

TTX115: Mechanics of Textile Machinery

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Expression for power transmission is
   a) $(T_2-T_1)V$ b) $(T_1-T_2)r$
   c) $(T_1-T_2)V$ d) $(T_1-T_2)v.r$
2. Rate of change of displacement without regarding the direction of motion is known as
   a) Velocity b) acceleration
   c) Speed d) angular velocity
3. The minimum most distance the bowl can travel over the profile of the tappet is known as
   a) least radius b) least dia
   c) least circumference d) maximum lift
4. The angular velocity of traveler rotating at 8400 rpm in rad/sec is
   a) 860.54 b) 898.58
   c) 879.64 d) 790.86
5. A phenomenon which produces or tends to produce motion or change of motion in a body is defined as
   a) Force b) momentum
   c) Energy d) work
6. Joules/second is the unit of
   a) Energy b) work
   c) Power d) momentum
7. If an object is moved along a distance of 1 meter by a force of 1 N, then the work done is
   a) 10 Joules b) 1 Joule
   c) 1 KW d) 1HP
8. Potential energy is expressed by the formula
   a) mgh b) ma
   c) $0.5\ mv^2$ d) GmM/R^2
9. Friction between two surfaces does not depend on
   a) Materials surfaces b) state of surfaces
   c) pressure between the surfaces d) Area of contact
10. Amonton's law is given by the expression
    a) $T_s = T_t e^{\mu\theta}$ b) $T_t = T_s e^{\mu\theta}$
    c) $F = \mu N$ d) $F = R\sin\text{Ø}$

PART B (10 x 2 = 20 Marks)

11. Compare belt drive with gear drive.
12. What is epicyclic gear train?
13. What is the function of 'cam'? Mention any four applications of cams in textile industry.
14. A hydro-extractor is revolving at 17.5 rad/sec. Calculate it's period of revolution and rotational speed in rpm.
15. Narrate the relationship between force, time and momentum.
16. Give the equations of motions for linear and curvilinear motions.
17. How principle of moments is applied in heald reversing system?
18. Give two examples for the application of kinetic energy in textiles.
19. Define sley eccentricity.
20. Classify clutches and brakes.

PART C (5 x 14 = 70 Marks)

21. a) (i) Prove that the centrifugal tension has no effect on power transmission. (7)
    (ii) Derive the condition for maximum power transmission (7)

(OR)

b) Explain Brook & Shaw differential with a neat sketch indicating all the necessary details. Also prove that the above differential is a bobbin lead system with data given below.

- Input revolutions of main shaft: 350 rpm.
- Front roller delivery of roving frame: 1050 cm/min.
- Empty bobbin diameter: 4.0 cm.
- Assume any other relevant data.

22. a) Design and draw the profile of the cone drums for speed frame with the following particulars.

- Empty bobbin diameter : 30 mm
- Full bobbin diameter : 170 mm
- Sum of top and bottom cone drum diameters : 480 mm
- Belt shift : 900 mm
- Diameters of driving and driven cones are equal when the bobbin is 50% full.
- Assume any other relevant data.

(OR)

b) Design and draw the profile of a ring frame shaper cam with following particulars.

- Base and nose diameters of cop are 13/8'' and 7/8''.
- TPI of the material is 20.
- The lift (or) chase length is 2''.

- The winding and binding coils ratio is 2.6:1.
- NPC of the cam is 3.5''.
- Bowl diameter is 2.5''.
- No. of leaf on cam is 1.

23. a) (i) A loom shuttle requires 1/12 of a second to pass through the warp shed having 5 feet width. Find the average velocity if it is subjected to a retardation of 30 feet/sec^2 (7)

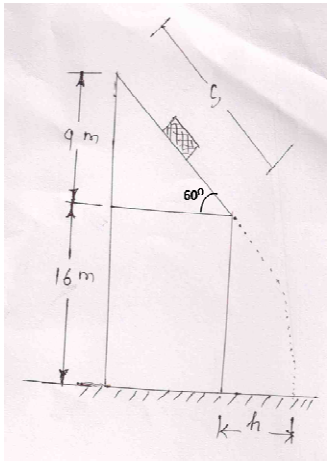
(ii) In a ring frame, the spindle speed is 15000 rpm This is driven by a tape that passes with right angled lap around 2.5 cm wharve diameter. The co-efficient of friction is 0.18 and the frictional force is 1.8 N. Calculate the maximum power required to drive the spindle and tensions in the tape. (7)

(OR)

b) (i) A shuttle 1 m above floor level and moving at 10 m/s flies out of a loom at an angle of 0.15 rad above the horizontal. How high will it rise, how far horizontally from its starting position is the place where it lands, what is its velocity is as it strikes the floor and what is the angle of landing? (8)

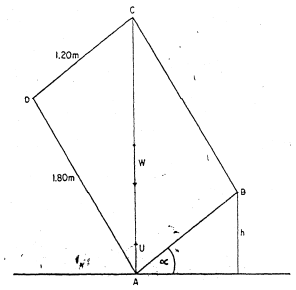
(ii) A shuttle is moving at 40 m/s when it enters the warp shed and moves 2 meters before it is through the shed. During its passage, it is subjected to a retardation, which may be considered uniform, of 30 m/s^2. Find the time it takes to traverse the shed and its velocity when leaving. (6)

24. a) (i) A bale weighing 100 kgs comes down on a smooth shoot as shown in figure. Find the potential and kinetic energy of the bale at the top and bottom of the shoot and at floor level. Also find the time to traverse the shoot, the total time of the fall and the horizontal distance 'h'. (7)



(ii) A bale of cotton fibre, of height 1.8 m, has a base of side 1.2 m. Calculate the (7)

height to which one edge of the base can be lifted before the bale topples over. The situation which exists as the bale is on the point of toppling is shown in figure. The weight W of the bale acts vertically downwards through A, the edge at which the up thrust, U is exerted on the edge B, at a distance 'h' above the ground, is at its maximum height before toppling occurs.



(OR)

b) A sphere of mass 20 kg, moving at 8 m/s, overtakes and collides with a second one of mass 40 kg, travelling at 5 m/s along the same straight line. Find the velocities of the two after impact and the kinetic energy loss in each case:
   a) If collision is perfectly inelastic
   b) If collision is perfectly elastic
   c) If the co-efficient of restitution is 0.5

25. a) (i) Derive the relationship for sley eccentricity with the variables, crank radius and connecting arm length. (7)

(ii) In a band brake, the drum diameter is 60 cm, the band makes an angle of 240° co-efficient of friction is 0.3. and the drum is revolving at 180 rpm. One end of the band is fixed and the other end is taken around the drum and fixed in the weighing lever at a distance of 5 cm from the fulcrum and a dead weight of 25 kgs is placed in a lever at a distance of 40 cm from the fulcrum. Calculate the work done/rev. and power consumption, when the drum is revolving at (7)
   - Clockwise direction
   - Anti-clockwise direction

(OR)

b) (i) Derive the expression for the tension acting in warp sheet in a negative let-off motion. (7)

(ii) Draw the sketch of the single plate clutch indicating the parts. Also derive the expressions for the axial force and torque transmitting capacity assuming uniform wear condition. (7)

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