Register No: ……..

B.TECH DEGREE EXAMINATIONS: NOV/DEC 2010

Fifth Semester

TEXTILE TECHNOLOGY

U07TT505: Textile Mechanics

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

Answer ALL Question s:-

PART A (10 x 1 = 10 Marks)

1. The Angle of contact 'θ' for open belt drive is _____

(A) (180 - 2α) π / 180 rad (B) (180 + 2α) π / 180 rad (C) (180 - 2α) rad (D) (180 - 2α) rad

2. The ratio of driving tensions in a flat belt drive is _____

(A) $T_t / T_s = e^{\mu\theta}$ (B) $T_s / T_t = e^{\mu\theta}$ (C) $T_t = 3T_s$ (D) $T_0 = T_1 + T_2 / 2$

3. If a point moves such that its acceleration towards its mid-position is directly proportional to its displacement from that position, then the point is moving with _____ motion.

(A) Linear (B) Simple harmonic (C) Cycloidal (D) Hyperbolic

4. Angle of rise and Angle of return in a shedding cam are stated by the expression _____

(A)1.5 X Dwell Period (B) 3 X Dwell period (C) 0.5 X Dwell period (D) 2 X Dwell period

5. The power for picking in a rayon loom of 110cm reed space, running at 216 picks/min, with a shuttle of mass 450g, length 28 cm and picking angle 135 º is

(A) 0.109 kw (B) 0.142 kw (C) 100.2 J (D) 39.51 J

6. 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

7. Which of the following 'r/R' ratio is "Optimum" for spinning a cop in ring-frame?

(A) 0.38 (B) 0.5 (C) 0.1 (D) 1

Where r = Cop Radius in mm and R = Ring Radius in mm

8. Potential energy is best defined by which of the following mathematical expression?

(A) $0.5\ mv^2$ (B) mv^2 (C) mgh D) Force X distance / time taken

9. Pivoted double block brake is used in the braking of _____

(A) Ring frame spindle (B) Lap former C) Power loom D) Cone Drum

10. Which of the following type of clutch requires less axial force for power transmission?

(A) Single plate clutch B) Multi-plate clutch C) Friction clutch D) Cone clutch

PART B (10 x 2 = 20 Marks)

11. List the factors that influence the power transmission by a V-belt drive.

12. State the formula for velocity ratio of an epicyclic train.

13. State the difference between linear and simple harmonic cams.
14. State the assumptions involved in the design of ring frame shaper cam.
15. Compare the equations of motion for rectilinear and rotary movements.
16. State the formula to determine shuttle velocity.
17. What do you mean by potential energy?
18. State any two textile applications utilizing the concept 'principles of moments'.
19. What do you mean by internally expanding shoe brake?
20. In a single plate friction clutch, the inner and outer diameters of the friction disc are 120 and 220 mm respectively. The coefficient of friction is 0.20. The pressure at the disc surfaces is limited to 1.2 N/mm^2. The operating speed is 900 rpm. Calculate the power transmission capacity of clutch if it is new.

PART C (5 x 14 = 70 Marks)

21. a) (i) Derive the relationship for maximum power transmission in a flat belt drive. (7)

(ii) Discuss the nomenclature of gears with diagram. (7)

(OR)

b) (i) A double worm operating at 40 rev/min drives a sprocket of diameter 15 cm. If the worm pitch is 131.6 threads/m, calculate the angular velocity in rad/s of the driven shaft. (7)

(ii) A loom is driven by a V-rope drive from a motor running at 960 rpm. The effective pulley diameters when the rope is new are 8 cm and 40 cm for motor and loom respectively. After wear, however, the rope sinks in by 1.5 mm and slip (which was not present initially) becomes 5%. Calculate the percentage change in running speed of loom drive shaft. (7)

22. a) Draw the profile of a shedding tappet for a 3-shaft weave, the heald shaft staying down for one pick and up for two. Particulars of the movement are as follows: Nearest distance between tappet and bowl centres: 9 cm; Lift of tappet: 5 cm, Diameter of anti-friction bowl: 7.5 cm; Duration of Dwell: $1/3^{rd}$ of pick; Movement of heald shaft to be simple harmonic. Lift line can be considered straight and passing through tappet shaft centre.

(OR)

b) State the assumptions involved in the design of cone drums for scutcher. Also derive the relationship for the thickness 't' of the web passing through the piano feed regulation of scutcher unit in blow room. The speeds of the top and bottom cone drums are N_1 and N_2 respectively.

23. a) (i) A card cylinder rotates at 165 rpm. After the drive has been disengaged, the cylinder comes to rest after 140 revolutions in 1.7 min. Calculate the angular retardation of the card cylinder. (7)

(ii) In an automatic winding machine, the empty yarn holders are held in a magazine, which releases a fresh holder when required. The new holder drops vertically to its operating position through a distance of 30 cm. Calculate the time taken for the drop, given that the acceleration due to gravity is 9.8 m/s^2. Also determine the speed at which the new yarn holder reaches its operating position. (7)

(OR)

b) (i) A ring frame traveller, moving in a circle of 5 cm diameter at 9000 rpm offers a resistance to movement of 0.15 N. If the frame has 240 spindles, calculate the power expended in moving the travellers. (7)

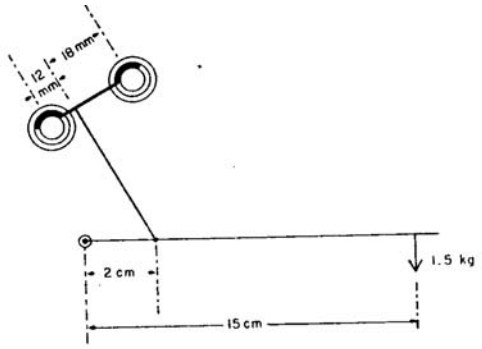
(ii) The swell of a loom reduces the speed of the shuttle from 15 to 10 m/s while the shuttle moves 10 cm. If the shuttle has a mass of 0.2 kg and the retardation is uniform, find the time taken and the value of checking force applied by the swell. (7)

24. a) (i) A horizontal weighting bar for a loom has its ends attached to the two beam weighting ropes, 1 m apart. The bar has a mass of 4 kg and carries two weights, one of mass 20 kg at a distance of 15 cm from the left hand rope and one of mass 12 kg at a distance 25 cm from the right hand rope. What force is applied to each of the weighting ropes? (7)

(ii) A bale of cotton fibre, of height 1.8 m, has a square base of side 1.2 m. Calculate the height to which one edge of the base can be lifted before the bale topples over. (7)

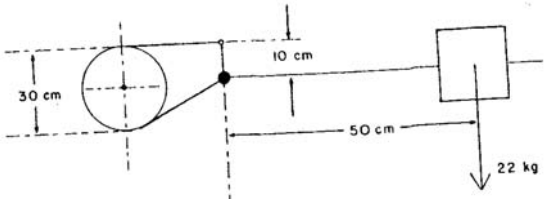
(OR)

b) (i) The weighting mechanism for the front drafting zone of a ring spinning frame is shown in figure below. The roller stand is at an angle of $\pi / 6$ rad to the horizontal with the link at right angles to the saddle between the front and middle lines of rollers. The lever has a mass of 0.2 kg and at its centre of gravity is 7.5 cm from the fulcrum. If the mass of saddle and link are negligible, calculate the forces applied by the saddle to the two rollers respectively. (7)



(ii) The two springs for reversing the motion of a heald shaft each have to be stretched 15 cm to put them in position with the heald shaft down. If the stiffness of each spring is 1.5 N/cm, find the work done in putting the springs in position. (7)

25. a) A band brake for a beam warping machine is arranged as shown in figure below. If $\mu = 0.5$ and the angle of lap is $4\pi/3$, what braking torque can be applied if the pulley rotates (i) clockwise (ii) counter-clockwise? (7)



(OR)

b) (i) Discuss the working mechanism of a cone clutch with a neat diagram indicating the parts. (7)

(ii) Derive expressions for axial force and torque transmitting capacity for the cone clutch. (7)

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