K 4520

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2009.

Seventh Semester

Textile Technology

TT 1402 — TEXTILE MECHANICS

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the sketch of a belt tension adjustment and indicate its purpose.

2. Compare the merits and demerits of a belt drive vis-à-vis gear drive.

3. State the differences between linear cam and SHM cam.

4. A disc cam is to give uniform motion to a knife edge follower during outstroke of 50 mm during first half of the cam revolution. The follower again returns to its original position with uniform motion during next half of the revolution. Draw the displacement diagram of the follower.

5. State the equations of motion.

6. State the equation for calculation of picking power requirements.

7. What do you mean by Potential energy?

8. Define principles of moments.

9. What is coil friction? Give equation for the same.

10. What are friction clutches? Give equation for torque transmitting capacity for a 2 plane disc friction clutch.

PART B — (5 × 16 = 80 marks)

11. (a) Derive the relationship between tight side and slack side tension in a belt drive. Also deduce the condition for maximum power transmission. Assume relevant data.

Or

(b) Explain Fallow's 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 : 365 rpm, Front roll delivery of roving frame : 1082 cm/min, Empty bobbin diameter : 3.35 cm. Assume any other relevant data.

12. (a) Construct the profile of cone-drums used in fly-frame with the following particulars :

Empty Bobbin diameter : 30 mm, Full Bobbin diameter : 180 mm, Sum of top and bottom cone diameters : 500 mm, Belt shift : 1000 mm. Diameters of driving and driven cones are equal when roving bobbin is 50% full. Assume any other relevant data.

Or

(b) Draw the profile of a shedding tappet for operating a 5-shaft weave, the heald shaft staying down for 4 successive picks and up for the fifth. Particulars are as follows :

Nearest distance between tappet and bowl centres : 3.5 inches; Lift of tappet : 2 inches; Diameter of anti-friction bowl : 3 inches; Duration of Dwell : 1/3rd of pick; Movement of heald shaft to be simple harmonic. Lift line can be considered straight and passing through tappet shaft centre. Assume any other relevant data.

13. (a) (i) A shuttle is moving at 40 m/s when it enters a warp shed, and moves 5 m before it is through the shed. During its passage, it is subject to a retardation which may be considered uniform, of 30 m/s². Find the time it takes to traverse the shed and its velocity when leaving.

(ii) Cloth is drawn forward by the take-up motion of a loom against a cloth tension of 300 N. If there are 60 picks/inch in the cloth and the loom speed is 180 picks/min, what work is done / min in taking up the cloth?

(8 + 8)

Or

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(b) **(i)** A loom weaving plain cloth has a timing diagram as given. If a warp thread is lifted through a distance of 8 cm with simple harmonic motion, produce a thread displacement diagram illustrating these weaving conditions.
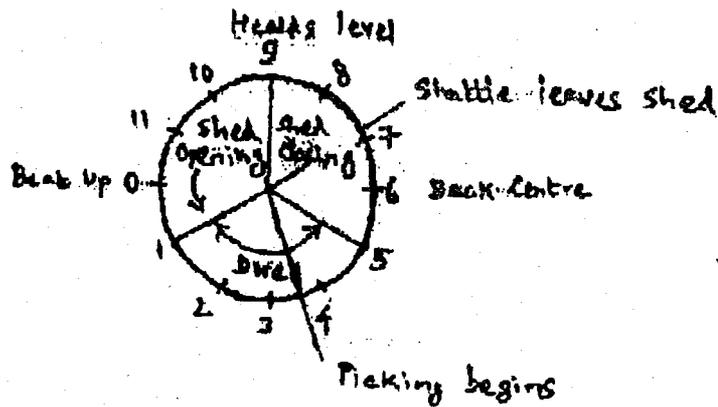
(ii) A jacquard loom produces a fabric with 20 picks/cm at a rate of 2.4 m/hr. If the pattern repeat in the fabric occurs at 36 cm intervals and the width of a card is 8 cm, calculate the length of the pattern chain and the angular speed of its motion. (8 + 8)

14. **(a)** 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, and what is its velocity is as it strikes the floor?

Or

(b) **(i)** A rod AB of length 30 cm, pivoted 10 cm from A, is used for suspending glassware. One piece of apparatus, with a mass of 500 g, is hung from A, a second piece, of mass 100 g is hung from B and a third piece, of mass 400 g, is hung 7.5 cm from the pivot on the side nearest B. Show that the system remains in equilibrium. What are the various measures taken to improve to quality of lubricants and also to reduce the consumption of lubricants in textile industries?

(ii) Draw and explain the forces acting in a heald reversing system and propose equations when the heald shaft is UP and DOWN. (8 + 8)

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

(ii) Draw a diagram of crank and connecting rod system, where the crank has a throw of 10 cm (crank arm 5 cm) and the connecting rod is 18 cm long. Use the diagram to measure the no. of degrees of crankshaft rotation for 4 cm movement of the far end of the connecting rod

(1) from the inner dead centre

(2) from the outer dead centre. (8 + 8)

Or

(b) Draw the sketch of a cone clutch indicating the parts. Also derive expressions for the axial force and torque transmitting capacity assuming uniform wear condition.