

THE OPEN UNIVERISITY OF SRI LANKA  
DEPARTMENT OF TEXTILE AND APPAREL TECHNOLOGY  
DIPLOMA IN TECHNOLOGY / DIPLOMA IN INDUSTRIAL  
STUDIES

FINAL EXAMINATION – 2014/2015

TTX3255 / 4260 WOVEN FABRIC TECHNOLOGY

DURATION: THREE HOURS

DATE: 24<sup>th</sup> August 2015

TIME: 09.30 – 12.30 hours

Total Number of Questions = 09

Number of questions to be answered = 06

Answer the question 1, which is compulsory and five (05) additional questions.

Question 1 carries thirty (30) marks and questions 2 to 9 carry fourteen (14) marks each.

01. Compulsory Question

- (a) State the five structural parameters of a woven fabric. (02Marks)
- (b) What is “crimp” of weft/warp yarn of a woven fabric? (02Marks)
- (c) Explain the two methods of yarn withdrawal from yarn packages providing sketches. (02Marks)
- (d) Provide a sketch to show how a yarn is threaded through a post tensioner. (02Marks)
- (e) What is the total number of threads to be wound onto the warp beam to weave the following plain weave fabric? Nylon 70d/30f x Nylon 50d/24f x 48 inches (02Marks)  
100 x 90 1/inch
- (f) When can we use “warp tying” instead of “warp drawing-in”? (02Marks)
- (g) State the three primary and two secondary motions of weaving. (02Marks)
- (h) Distinguish between “clear shed” and “irregular shed”. (02Marks)
- (i) What is “beat-up force”? (02Marks)
- (j) Distinguish between “single acting” and “double acting” dobby mechanisms. (02Marks)
- (k) Distinguish between the two rapier weft insertion techniques “tip insertion” and “loop insertion”. (02Marks)
- (l) What are the factors determining the weight of a shuttle? (02Marks)
- (m) State two limitations of the raw materials used in water jet weaving. (02Marks)
- (n) Distinguish between “positive” and “negative” let-off motions. (02Marks)
- (o) What is the major disadvantage of “side weft fork mechanism”? (02Marks)

02. a) Calculate the area density of the Nylon plain weave fabric, specifications of which are given in the question 01. (e) above. Assume warp and weft crimps of 6% and 8%. (09Marks)  
 b) State the type of machine you would select to produce a very large quantity of this fabric (mass production) economically. Give the weft insertion method, shedding method, other important features, and explain why do you select such a machine. (05 Marks)
03. The warp for the above mentioned Nylon fabric is to be produced on a beam warping machine with a creel capacity of 800.  
 a) Calculate the minimum number of back beams to be produced. (02Marks)  
 b) What is the approximate width between the flanges of the warp beams? (04Marks)  
 c) What are the specific properties to be processed by the sizing mixture to be used for this warp? (04Marks)  
 d) Explain the reasons for using of a direct warper than using a sectional warper for this job? (04Marks)
04. a) Distinguish between “split drum” and “grooved roller” traverse methods. (04Marks)  
 b) A grooved roller rotating at a speed of 3000 rpm is used to produce a cheese package on to a centre tube of 4cm diameter. The diameter of the grooved roller is 7.2cm. The yarn makes a single traverse per every 2.5 rotations of the grooved roller.  
 i. Determine the wind and traverse ratio at the beginning of winding. (05Marks)  
 ii. What are the wind and traverse ratio at a package diameter of 7.2cm (03Marks)  
 iii. What happens to the angle of wind with increasing package diameter? (02Marka)
05. a) Write short notes on: (06Marks)  
 i. A frame loom  
 ii. A vertical loom  
 iii. Drop wire bars  
 b) State and discuss all the advantages and disadvantages of conventional shuttle weaving. (08Marks)
06. A rigid rapier loom running at 550 rpm has a nominal reed width of 180 cm. A projectile loom running at 480 rpm has a nominal reed width of 230 cm.  
 a) Which of these looms has the higher nominal weft insertion rate? (03Marks)  
 b) Both the looms are used to produce a fabric with a reed-in width of 175 cm, calculate the working weft insertion rates of the two looms. (03Marks)  
 c) Compare the floor approximate space occupied by these two looms and state which loom you think would have a higher productivity per unit floor area. (04Marks)  
 d) State and explain briefly two methods employed by rapier loom manufacturers to reduce the total machine width. (04Marks)
07. a) What is the main problem associated with single nozzle air-jet weft propulsion? (02Marks)  
 b) Explain three different techniques employed by air-jet loom designers to overcome this problem. (06Marks)  
 c) What are the advantages of air-jet weaving over water-jet weaving? (04Marks)  
 d) Explain why is it necessary to use a weft pre-winder and measuring device for fluid jet-weaving. (02Marks)

08. a) Describe the difference between a “positive intermittent take-up” and a “positive continuous take-up”. (05Marks)
- b) The Figure 1 shows a five wheel take-up mechanism of a loom. R is a ratchet wheel and P is a pawl. A, B, C and D are gear wheels and E is the take-up roller. Let us assume that the number of teeth in the ratchet wheel as  $T_R$  and that in the gear wheels ABCD as  $T_A$ ,  $T_B$ ,  $T_C$ , and  $T_D$  respectively.
- i. Show that the pick density achieved by using this mechanism is given by the equation  
Pick density =  $K/T_A$ , where K is a constant. (04Marks)
- ii. If we want to weave a fabric of weft density 50 picks per inch, what should be the number of teeth of the change wheel  $T_A$ , if  $K = 1250$ ? (01Mark)

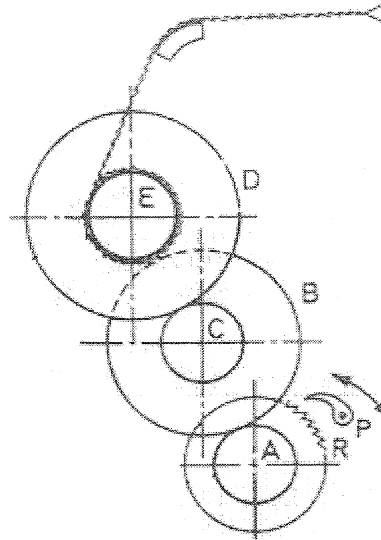


Figure 1: Take-up mechanism

- ii. If  $T_R = 150$  teeth and circumference of the take-up roller  $E = 12$  inches, what should be the gear ratio ( $T_B \cdot T_D / T_A \cdot T_C$ ) of the gear system? (02Marks)
- iii. Mention two different techniques used in weaving machines to derive the motion of the switching pawl of the take-up mechanism. (02Marks)
09. a) What are the functions of a reed? (04Marks)
- b) Give a labeled line diagram of a four link beat-up mechanism. (04Marks)
- c) Explain why,
- i. is it essential to use a cam driven beat-up mechanism (sley) in Sulzer projectile looms? (03Marks)
- ii. shedding traps (warp yarn clinging) are very critical for the performance of jet looms? (03Marks)