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| Mansoura University | Knitting & Apparel Machines | B.Sc. Exam |
| Faculty of Engineering | | January 2012 |
| Textile Engineering Department | | Time: 3 hours |

Answer the following questions:

Part (I): Knitting Machines:

(1) Classify and write about the various knitting machines used in knitting industry and explain the difference between weft and warp knitting machines and write in details about the advantages of each and the different yarns used in both weft and warp knitting machines.

[7 marks]

(2) Name as much as you can the circled numbered (eight) machine parts in both Arabic and English in Fig. (1), and draw a typical cam system of a single knit- single jersey and show the name of each part in the cam system. Also draw the elements of purl knitting machine.

[7 marks]

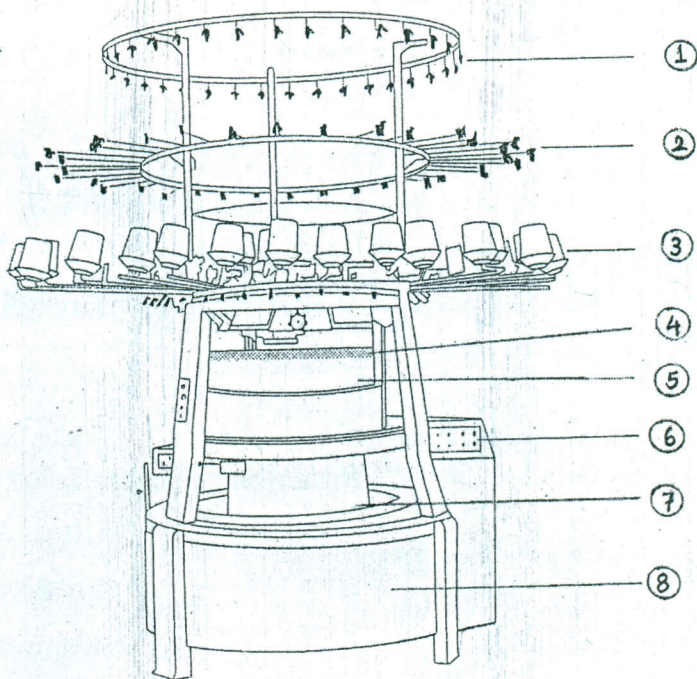


Fig. (1): Diagram of circular knitting machine

- (3) For a circular knitting machine with a linear cam, prove that the total torque (T_n) required to move the needles through the cam system is given by:

$$T_n = \frac{2DP_0r_2}{P \tan\theta} \left[\frac{\sin\theta + \mu\cos\theta}{\cos\theta(1 - \mu^2) - 2\mu \sin\theta} \right]$$

Where:

T_n = The total torque required to move the needles through the cam systems.

D = Total displacement of the needles.

P_0 = Force exerted to move the needle vertically.

P = Needle spacing.

r_2 = Radius of cam.

θ = Angle of linear cam.

μ = Coeff. of friction between needle and cylinder walls and between needle and cam face. [7 marks]

- (4) (A) Define: (Rack, Quality, Run-in-ratio)

(B) Draw a schematic diagram of warp knitting m/c showing the various parts of the m/c, and explain very briefly the function of each part.

(C) Sketch the following pattern (8x8) knitted on a warp knitting m/c.

Front guide bar: feeding: 1 in, 1 out

Knitted structure: two-coarse atlas stitch.

Back guide bar: feeding: full

Knitted structure: open tricot stitch. [7 marks]

- (5) It is needed to produce a piece of plain knitted fabric on a flat knitting m/c with the following specifications:

- Fabric length = 20 cm
- Fabric width = 0.6 m
- Fabric weight = 214.3 g/m²
- Yarn count (tex) = 71 x 2
- Waste = 2 %
- $K_c = 5.237$, $K_w = 3.407$

Calculate:

- 1) Loop length (cm)
- 2) Courses / cm
- 3) Wales / cm
- 4) Total no. of needles needed to produce the piece.
- 5) Total no. of courses needed to produce the piece.
- 6) Amount of yarn required to produce the piece (grams).
- 7) Needle gauge
- 8) Approximated machine gauge.

[8 marks]

Part (II): Apparel Machines: [24 marks]

- (1) اشرح مع الرسم أجزاء إبرة ماكينة الحياكة؟ وما وظيفة كل جزء فيها؟
- (2) اشرح بالتفصيل الأجزاء المختلفة التي تتكون منها فرشاة الماكينة (Machine bed) وما وظيفة كل جزء منها؟
- (3) اشرح مع الرسم المقص الكهربائي المستدير وما هو الغرض من استعماله؟
- (4) اشرح مع الرسم غرزة السلسلة المفردة وطريقة تكوينها وبما تمتاز؟ وفيما تستخدم؟
- (5) اشرح دورة تكوين الغرزة الواحدة نتيجة دوران العمود الرئيسى لماكينة الحياكة لفة واحدة.
- (6) استنتج معادلات الإزاحة - السرعة - العجلة لميكانيزم إبرة الحياكة.

With my best wishes

Prof. Dr. Hemdan Abou-Taleb