KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 2nd Year 2nd Term Examination, 2018
ME 2221
(Solid Mechanics and Machine Design)

Time: 3 Hours   Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.
  ii) Figures in the right margin indicate full marks.
  iii) Assume reasonable data if missing any.
  iv) Reference Book-"Design of Machine Elements", 4th Edition by V.M. Faires.

SECTION-A

1(a) Explain the following terms: 08

 i) Normal stress ii) Shearing stress iii) Hook's law and iv) Poisson's ratio

1(b) Compute the shearing stress in the Pin at B for the member supported as shown in figure.   15
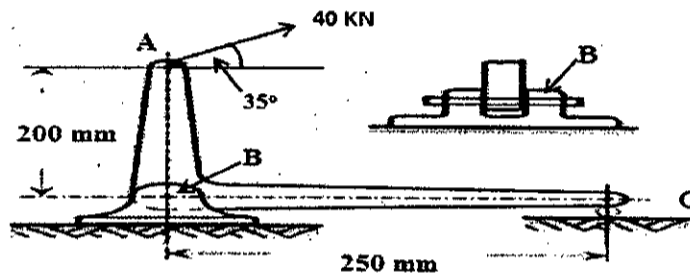 The Pin diameter is 20mm.

Figure: 1(b)

1(c) A cylindrical steel pressure vessel 400mm in diameter with a wall thickness of 20mm, is   12
 subjected to an internal pressure of 4.5 MN/m^2.

 i) Calculate the tangential and longitudinal stresses in the steel.

 ii) To what value may the internal pressure be increased if the stress in the steel is limited
 to 120 MN/m^2?

 iii) If the internal pressure were increased until the vessel burst, sketch the type of
 fracture that would occur.

2(a) Draw the stress-strain diagram for structural steel. Why does rupture strength lower than   08
 the ultimate strength? Explain.

2(b) A uniform concrete slab of total weight W is to be attached, as shown in figure, to two   12
 rods whose lower ends are on the same level. Determine the ratio of the areas of the rods
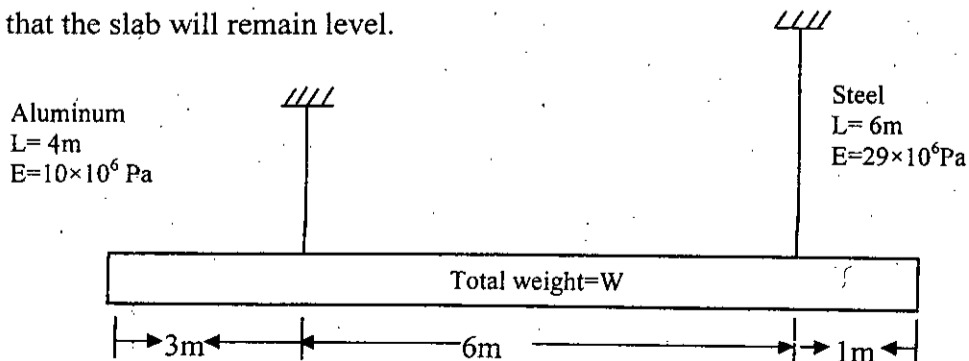 so that the slab will remain level.

Figure: 2(b)

2(c)   A rigid bar of negligible weight is supported as shown in figure. If W=80 kN, compute   15
the temperature change that will cause the stress in the steel rod to be 55MPa . Assume
the coefficients of linear expansions are 11.7 μ m/(m°c) for steel and 18.9 μ m/(m°c) for
bronze.

```
            ////                          ////
      ////  Steel                     Bronze
            L=1.5m                    L=3 m
            A=320mm²                  A=1300 mm²
     →1m←   E=200GPa                  E=83GPa
  ___
 |O|_____
     |——————2.5m——————|←——1.5m——→|
```
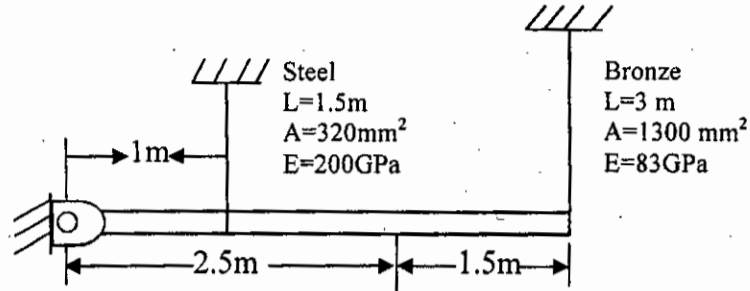
Figure: 2(c)

3(a)   A compound shaft consisting of steel segment and an aluminum segment is acted upon by   17
two torques as shown in figure. Determine the maximum permissible value of T subject
to the following conditions:-

$\tau_{st} \le$ 83MPa, $\tau_{al} \le$ 55MPa and the angle of rotation of free end is limited to 6°. For steel
G=83GPa and for aluminum G=28GPa.

```
    |
    |\  _____50 mm dia._____2T   40 mm dia.      T
    |\ (_____)
    |\  |      Steel           |  Aluminium        |
    |\  |_____ |_____|
    |
        |————————900mm————————→|←———— 600 mm ———→|
```
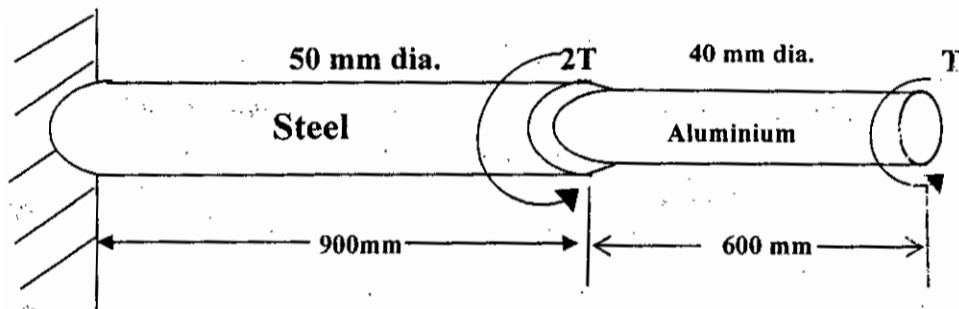
Figure: 3(a) .

[Ref: strength of Materials-Pytel & Singer,4th Ed, Problem-316, Page-74]

3(b)   A rigid bar, hinged at one end, is supported by two identical springs as shown in figure.   18
Each spring consists of 20turns of 10mm wire having a mean diameter of 150mm.
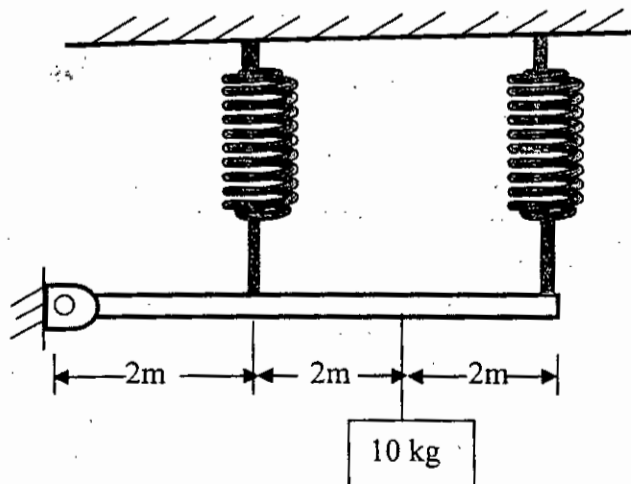Compute the maximum shearing stress in the springs. Neglect the mass of the rigid bar.

```
        ///////////////////////////
           ▤                ▤
           ▤                ▤
           ▤                ▤
    ___     |                |
   |O|_____|_____|_____
           |————2m————|←—2m—→|←—2m—→|
                           |
                        ┌──────┐
                        │10 kg │
                        └──────┘
```

Figure: 3(b)

4(a)   What is flexural stress? Show that the maximum flexural stress occurs at the section of   17
maximum bending moment.

4(b) Write shear and moment equations for the simple supported beam carrying different types of load as shown in figure. Also draw shear and moment diagrams specifying value at all change of loading positions and points of zero shear. Neglect the mass of the beam.   18
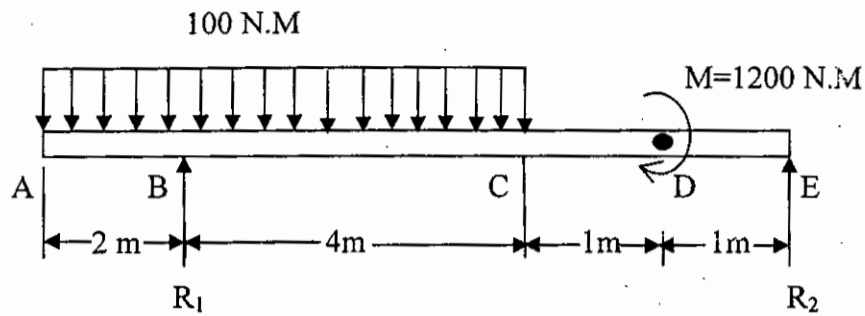
100 N.M

Figure: 4(b)

SECTION-B

5(a) A ¾ in bolt, made of cold finished B1113, has an effective grip length of 4in and an effective stress area of 0.334sq.in. The bolt is to be loaded by tightening until the tensile stress is 80% of the yield strength, as determined by measuring the total elongation. What should be the total elongation? [Prob-10 of Ref. book]

5(b) A centrifugal pump is to be driven by a 12hp electric motor at 1800rpm. The load is gradually repeated. What should be the standardized diameter of the pump shaft, if it is made of AISI 1340(OQT1200)?   20

6 A cold-finished shaft, AISI 1141, is to transmit power that varies from 200 to 100 and back to 200hp in each revolution at a speed of 600rpm. The power is received by a 20in spur gear A and delivered by a 10in spur gear C. The tangential forces have been converted into a force (A and C shown) and a couple (not shown). The radial component R of the tooth load is to be ignored in the initial design. Let N=2 and considering varying stresses with maximum shear theory, compute the shaft diameter.   35
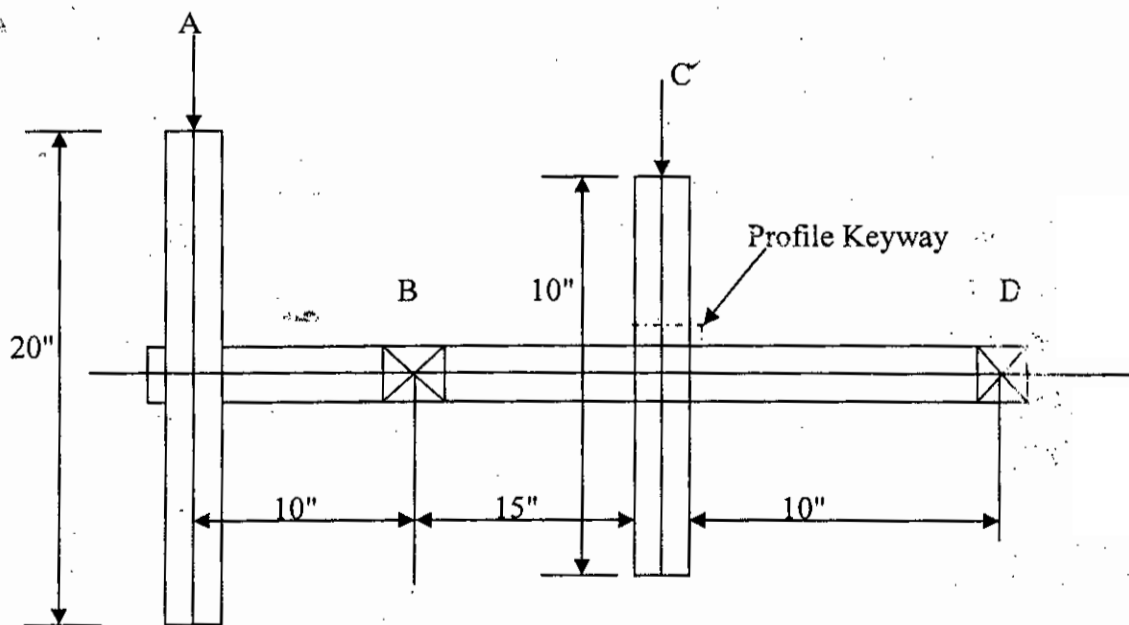

Figure: 6
[See reference Book, Problem-472]

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 2nd Year 2nd Term Examination, 2018

TE 2203

(Fabric Manufacturing Engineering-I)

Time: 3 Hours · Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION-A

1(a) Show the flow chart of weaving. 05

1(b) Describe different types of winding packages. 12

1(c) Define yarn guide. Describe about different types of yarn guides. 07

1(d) Define traverse velocity, coil angle & winding rate. 06

1(e) The rate of winding of modern machine is 400yds per min. Calculate the no. of drums required to wind 300 lbs. of 40^sNe from ring bobbin in 8hrs, if efficiency 90%. (Allow 2% for waste) 05

2(a) What is meant by ball warping? In which sector ball warping is preferable & why? 10

2(b) Mention the causes and remedies of warping process faults. 10

2(c) Establish the relationship between taper angle & amount of yarn on a beam. 10

2(d) Write down the importance of pre-wetting. 05

3(a) Discuss the technological changes of yarn due to sizing. 08

3(b) Write down the functions and examples of the following size ingredients: 06
i) Tinting agent, ii) Hygroscopic agent, and iii) Wetting agent.

3(c) Draw the slasher sizing machine with proper labeling. 07

3(d) Mention some drying systems and which one is best? Give your opinion. 06

3(e) A beam of 300kg contains sized yarn of 10% take up. If the unsized count Ne. Calculate the sized count. 08

4(a) Classify the loom. 05

4(b) Describe the different motions of loom with neat sketch. 12

4(c) Define the terms: Drawing, Denting, Drawing-in & Drafting. 08

4(d) Fabric specification: $\frac{10 \times 8}{70 \times 50} \times 60"$. Calculate the weight of fabric of 1000m whose warp and weft crimp is 4% and 6% respectively. 10

SECTION-B

5(a) Differentiate between knitting and Braiding machine. 08

5(b) Make a comparison among kink of yarn, knitted loop and knitted stitch. 08

5(c) Draw and describe different parts of a loop. 07

5(d) State the procedure to determine stitch density of a knitted fabric. 12

6(a)   Write short notes on the followings: 06

       i) Binding elements of knitted structures

       ii) Fabric draw-off

       iii) Knitting cam

6(b)   Describe the knitting action of latch needle with neat sketch.   1/

6(c)   Define sinker. Draw a sinker with proper labeling.   05

6(d)   Mention the advantages, disadvantages and uses of spring bearded needle   06

7(a)   Write short notes on the followings: 06

       i) Laddering.

       ii) 6×3 Derby Rib.

       iii) Eight lock structure.

7(b)   Describe the following designs with lapping diagram, cam arrangement and needle   15
       arrangement.

       i) Fred perry design

       ii) Polka rib

       iii) Popcorn

7(c)   Differentiate between rib machine and interlock machine.   08

7(d)   Mention the features of purl structure.   06

8(a)   Write down the cam arrangement and needle arrangement of double pique & birds eye   10
       design.

8(b)   Describe the knitting action of a circular rib machine with neat sketch.   15

8(c)   List out the main features of a purl fabric.   05

8(d)   Write short notes on cut edge fabric & tubular fabric.   05

--) END (---

SECTION-A

1(a)	What are the differences between simple structure and compound structure?	05
1(b)	Describe the method of fabric presentation.	08
1(c)	Write short notes on the followings:	12

i) Contact field, ii) Interlacing field, iii) Free field, iv) Open field, v) Interlacing ratio, and vi) Degree of interlacing

1(d)	Briefly describe the classification of drafting.	10

2(a)	Classify satin weaves.	03
2(b)	State the conditions for selection of move number of satin weaves.	07
2(c)	Why skip drafts are used?	03
2(d)	How drafting plan can be indicated by ruling line?	04
2(e)	What are the differences between satin and sateen weave. Give graph paper examples.	18

3(a)	Define warp faced and weft faced twill with example.	06
3(b)	Explain the factors affecting the prominence of twill line.	08
3(c)	State the common features of twill weave.	05
3(d)	Give graph paper example with drafting and lifting plan of the following designs:	16

i) Vertical Herring bone based on $\frac{3}{4}$ twill

ii) Elongated twill based on $\frac{5}{4}$ twill

4(a)	What is meant by twill angle?	03
4(b)	Show the main differences between broken twill and rearranged twill.	08
4(c)	Give graph paper example with drafting and lifting plan of the followings:	24

i) Warp way combined twill based on $\frac{3}{3}$ twill and $\frac{2}{2}$ twill.

ii) Cork screw weave on 11×11.

iii) Diaper weave on 16×16 with $\frac{5}{3}$ twill base.

SECTION-B

5(a) State the features of plain weave.   10

5(b) Briefly describe the ornamentation of plain cloth.   08

5(c) Make comparison between warp rib & weft rib.   10

5(d) Write short note on matt rib.   07

6(a) What is meant by texture & structure of a woven fabric?   08

6(b) Give graph paper example with drafting and lifting plan of the followings: 27

    i) $\frac{1}{1}(6+3)$ weft rib.

    ii) $\frac{5}{3}(5+3)$ Matt.

    iii) Fancy matt $\frac{5}{5}(5)$ weave

7(a) Write down the common features and end uses of Brighton Honey comb. Give graph   12
paper example of a Brighton Honey comb design on 12×12 with drafting plan.

7(b) Define and classify stripe and check weave.   08

7(c) Give an example of Hucka back design.   15

8(a) How would you produce crepe effect on plain and satin base? Explain with graph paper   18
example.

8(b) What is wadded thread? Why is it used in the Bedford cord design?   05

8(c) Mention the technical features and end-uses of crepe, Bedford and mock leno weaves.   12

--) END (---

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 2nd Year 2nd Term Examination, 2018
TE 2209
(Fabric Structure and Design-I)

Time: 3 Hours   Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION-A

1(a)	What are the differences between simple structure and compound structure?	05
1(b)	Describe the method of fabric presentation.	08
1(c)	Write short notes on the followings:	12

i) Contact field, ii) Interlacing field, iii) Free field, iv) Open field, v) Interlacing ratio, and vi) Degree of interlacing

1(d)	Briefly describe the classification of drafting.	10

2(a)	Classify satin weaves.	03
2(b)	State the conditions for selection of move number of satin weaves.	07
2(c)	Why skip drafts are used?	03
2(d)	How drafting plan can be indicated by ruling line?	04
2(e)	What are the differences between satin and sateen weave. Give graph paper examples.	18

3(a)	Define warp faced and weft faced twill with example.	06
3(b)	Explain the factors affecting the prominence of twill line.	08
3(c)	State the common features of twill weave.	05
3(d)	Give graph paper example with drafting and lifting plan of the following designs:	16

i) Vertical Herring bone based on $\frac{3}{4}$ twill

ii) Elongated twill based on $\frac{5}{4}$ twill

4(a)	What is meant by twill angle?	03
4(b)	Show the main differences between broken twill and rearranged twill.	08
4(c)	Give graph paper example with drafting and lifting plan of the followings:	24

i) Warp way combined twill based on $\frac{3}{3}$ twill and $\frac{2}{2}$ twill.

ii) Cork screw weave on 11×11.

iii) Diaper weave on 16×16 with $\frac{5}{3}$ twill base.

SECTION-B

5(a) State the features of plain weave.   10

5(b) Briefly describe the ornamentation of plain cloth.   08

5(c) Make comparison between warp rib & weft rib.   10

5(d) Write short note on matt rib.   07

6(a) What is meant by texture & structure of a woven fabric?   08

6(b) Give graph paper example with drafting and lifting plan of the followings: 27

   i) $\frac{1}{1}$(6+3) weft rib.

   ii) $\frac{5}{3}$ (5+3) Matt.

   iii) Fancy matt $\frac{5}{5}$ (5) weave

7(a) Write down the common features and end uses of Brighton Honey comb. Give graph   12
paper example of a Brighton Honey comb design on 12×12 with drafting plan.

7(b) Define and classify stripe and check weave.   08

7(c) Give an example of Hucka back design.   15

8(a) How would you produce crepe effect on plain and satin base? Explain with graph paper   18
example.

8(b) What is wadded thread? Why is it used in the Bedford cord design?   05

8(c) Mention the technical features and end-uses of crepe, Bedford and mock leno weaves.   12

--) END (---

SECTION-A

1(a)	What are the differences between simple structure and compound structure?	05
1(b)	Describe the method of fabric presentation.	08
1(c)	Write short notes on the followings:	12

i) Contact field, ii) Interlacing field, iii) Free field, iv) Open field, v) Interlacing ratio, and vi) Degree of interlacing

1(d)	Briefly describe the classification of drafting.	10

2(a)	Classify satin weaves.	03
2(b)	State the conditions for selection of move number of satin weaves.	07
2(c)	Why skip drafts are used?	03
2(d)	How drafting plan can be indicated by ruling line?	04
2(e)	What are the differences between satin and sateen weave. Give graph paper examples.	18

3(a)	Define warp faced and weft faced twill with example.	06
3(b)	Explain the factors affecting the prominence of twill line.	08
3(c)	State the common features of twill weave.	05
3(d)	Give graph paper example with drafting and lifting plan of the following designs:	16

i) Vertical Herring bone based on $\frac{3}{4}$ twill

ii) Elongated twill based on $\frac{5}{4}$ twill

4(a)	What is meant by twill angle?	03
4(b)	Show the main differences between broken twill and rearranged twill.	08
4(c)	Give graph paper example with drafting and lifting plan of the followings:	24

i) Warp way combined twill based on $\frac{3}{3}$ twill and $\frac{2}{2}$ twill.

ii) Cork screw weave on 11×11.

iii) Diaper weave on 16×16 with $\frac{5}{3}$ twill base.

SECTION-B

5(a) State the features of plain weave.   10

5(b) Briefly describe the ornamentation of plain cloth.   08

5(c) Make comparison between warp rib & weft rib.   10

5(d) Write short note on matt rib.   07

6(a) What is meant by texture & structure of a woven fabric?   08

6(b) Give graph paper example with drafting and lifting plan of the followings: 27

    i) $\frac{1}{1}(6+3)$ weft rib.

    ii) $\frac{5}{3}(5+3)$ Matt.

    iii) Fancy matt $\frac{5}{5}(5)$ weave

7(a) Write down the common features and end uses of Brighton Honey comb. Give graph   12
    paper example of a Brighton Honey comb design on 12×12 with drafting plan.

7(b) Define and classify stripe and check weave.   08

7(c) Give an example of Hucka back design.   15

8(a) How would you produce crepe effect on plain and satin base? Explain with graph paper 18
    example.

8(b) What is wadded thread? Why is it used in the Bedford cord design?   05

8(c) Mention the technical features and end-uses of crepe, Bedford and mock leno weaves.   12

--) END (---

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 2nd Year 2nd Term Examination, 2018
TE 2213
(Textile Testing-I)

Time: 3 Hours   Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION-A

1(a)	Write short notes on : i) Blue Wool, ii) Light sources used in Textile testing, iii) U%, and iv) CV%	12
1(b)	Define Moisture regain and Moisture content.	05
1(c)	Establish a relation between moisture regain and moisture content.	12
1(d)	Briefly explain the effect of moisture on textiles. What is Twist factor?	06
2(a)	What is relative humidity? Show a method of measuring relative humidity.	08
2(b)	Why moisture regain is important for textile materials? What is Periodic variation of irregularity?	08
2(c)	Write short notes on the followings:	12
	i) Multi-fiber fabric, ii) Grey scales, iii) Types of twist, and iv) Uster tester 5.	
2(d)	Show a method of measuring moisture of a yarn package.	07
3(a)	What is yarn evenness? Describe a yarn evenness test.	07
3(b)	Define Yarn Hairiness. Discuss an established yarn hairiness test.	10
3(c)	State the disadvantages of laboratory tests and wearer trials.	06
3(d)	Write about the causes of irregularity of yarn.	06
3(e)	Show a relation between twist angle and yarn count.	06
4(a)	Define count. Show a relation between yarn diameter and count.	12
4(b)	Weight of 2000m Nylon yarn is 1.6g. Find count of it in Denier, Tex, Nm, Ne and Worsted count.	10
4(c)	Narrate a procedure of measuring count of a yarn.	08
4(d)	"Tex is a universal count system"-Explain this statement.	05

SECTION-B

5(a)	Write about the factors affecting tensile properties of textiles.	10
5(b)	Define the following terms:	12
	i) Tensile strength, ii) Work of rupture, iii) Gauge length, and iv) Strain.	
5(c)	Illustrate the differences between a typical Force-Elongation curve and a Force-Extension curve.	13

6(a)	Tabulate the relationship between twist and yarn strength.	07
6(b)	Write short notes on: i) CRL, ii) CRT, iii) CRE, and iv) Bending length.	08
6(c)	What is meant by Drape? Mention the testing procedure of drape of a fabric.	10
6(d)	Describe a process of measuring fabric dimensional stability.	10
7(a)	Explain the working principle of Shirley stiffness tester.	12
7(b)	Describe the procedure of fabric thickness measurement by Heal's thickness gauge.	10
7(c)	How the crease recovery angle can be measured by Shirley crease recovery tester? Describe the procedure with experimental set up.	13
8(a)	Derive the equation of take up percentage in terms of crimp percentage.	08
8(b)	What is cover factor? The specification of a voile fabric is $\frac{60's \times 54's}{60 \times 40} \times 58"$. What is the cloth cover of this fabric?	12
8(c)	Define crimp%. Describe the working principle of WIRA crimp tester.	15

--) END (---

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 2nd Year 2nd Term Examination, 2018
TE 2227
(Mechanics of Textile Structures)

Time: 3 Hours   Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION-A

1(a) Show a schematic diagram of a SEM with brief description.   10

1(b) Write down the effect of fiber length and fineness on yarn strength.   05

1(c) Discuss the analysis of fiber crystallinity by X-ray diffraction method.   10

1(d) Describe briefly the effects of fiber structure on fiber properties.   10

2(a) Define flexural rigidity. Prove that, Specific flexural rigidity $= \frac{1}{4\pi} \cdot \frac{\eta E}{\rho}$, where the   13
symbols have their usual meanings.

2(b) Breaking twist of cotton fiber is 50 and diameter of it is 0.015 mm. Find out the BTA of   03
it.

2(c) Describe a process of measuring dielectric constant of a textile material.   09

2(d) Write short notes on: i) Breaking twist, ii) Breaking twist angle, iii) Bending Modulus,   10
and iv) Shape factor.

3(a) Write short note on Modern theory of Static Electricity.   05

3(b) Discuss the effect of static electricity on the soiling of cotton fabric.   10

3(c) Which factors affect the dielectric properties of textile material?   12

3(d) Write short notes on the following: 08
i) Heat of wetting, ii) Glass transition temperature, iii) Refractive index, and iv) Torsional
properties.

4(a) Define swelling. Classify swelling with brief description and sketch.   12

4(b) Establish the relationship between transverse area swelling and transverse diameter   10
swelling.

4(c) How the swelling phenomenon can be used practically in textiles to improve   08
functionality?

4(d) State the effect of lubricant on frictional force.   05

SECTION-B

5(a) Define yarn contraction and retraction factor. Show that, retraction factor, $R_y = 1 - \frac{1}{C_y}$;   13
where the symbols have their usual meanings.

5(b) What is Schwarz's constant? Prove that Schwarz's constant, $K = 1 - \dfrac{0.7}{\sqrt{n}}$ or $K = 1 - \dfrac{1}{\sqrt{n}}$.   07

5(c) State the assumptions of idealized yarn geometry.   05

5(d) Show that, yarn diameter, $d = 36 \Big/ \sqrt{Ne}$ mill, where d = yarn diameter and Ne = yarn count   10 in English system.

6(a) What is fiber migration? Briefly discuss the mechanism of fiber migration.   10

6(b) Briefly discuss the effect of fiber properties on yarn strength.   07

6(c) From idealized yarn geometry, prove that $\tan \alpha = 0.0112\, V_y^{\frac{1}{2}} \tau$, where the symbols have   12 their usual meanings.

6(d) State the factors on which crimp% depends.   06

7(a) Discuss the experimental set up and calculations involved in Riding's Experiment for   14 fiber migration.

7(b) From pierce's model of fabric geometry, prove that $h_1 = \dfrac{4}{3} P_2 \sqrt{C_1}$, where the symbols   15 have their usual meanings.

7(c) Write down the equation of crimp interchange.   06

8(a) For yarn jamming, Prove that $h_1 = \sqrt{D^2 - P_1^2}$ where the symbols have their usual   08 meanings.

8(b) State the concept of similar cloth.   02

8(c) Prove that, $\dfrac{\sqrt{C_1}}{n_2} + \dfrac{\sqrt{C_2}}{n_1} = 0.27 e \left(\dfrac{1}{\sqrt{N_1}} + \dfrac{1}{\sqrt{N_2}} \right)$, where the symbols have their usual meanings.   10

8(d) A cotton fabric of 20tex warp and 38tex weft, $P_1 = 0.0357$cm, $P_2 = 0.04$cm, $1_1 = 7.63$ 15 mills, $\rho = 1.5$ g/cc. Find out : $n_1, n_2, h_1, h_2, c_1, c_2, \theta_1, \theta_2, d_1, d_2$.

--) END (---

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 2nd Year 2nd Term Examination, 2018
EE 2221
(Instrumentation and Electrical Control)
Time: 3 Hours   Total Marks: 210
N.B.: i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION-A

1(a)   Define measurement and instrumentation system. Draw and explain the block diagram of   08
a basic instrumentation system.

1(b)   Derive the relative limiting error formula for product of two components and composite   10
factors $X=x_1^n.x_2^m$. Also determine the maximum and minimum values of relative limiting
error in these cases.

1(c)   What is meant by deflecting torque and damping torque of PMMC? Briefly explain the   11
procedure of extending the range of Ammeters.

1(d)   The solution for a Wheatstone bridge is $R_4=\dfrac{R_1R_2}{R_3}$, where $R_1=500\,\Omega\pm1\%$, $R_2=615\,\Omega\pm1\%$,   06

$R_3=100\,\Omega\pm0.5\%$. Determine the magnitude of the unknown resistance and the limiting
error in percent.

2(a)   Derive the general torque equation of moving iron instrument and show that the deflection   12
is proportional to the square of the rms value of operating current.

2(b)   What are the methods for measurement of low and high resistance? Describe the "loss of   10
charge" method for measurement of high resistance.

2(c)   What is meant by an AC bridge? Derive the equation for unknown capacitance of a low   08
voltage schering bridge.

2(d)   A permanent magnet moving coil instrument has a coil of dimension 15mm×12mm. The   05
flux density in the air gap is 1.8×10^{-3} Wb/m^2 and the spring constant is 0.14×10^{-6} Nm/rad.
Determine the number of turns required to produce an angular deflection of 90° when a
current of 5mA is flowing through the coil.

3(a)   Define and classify the transducers. Write down the differences between a transducer and   10
a sensor.

3(b)   Write down the few applications of strain gauge. Determine the expression of gauge   15
factor using the theory of strain gauge.

3(c)   Mention the advantages and disadvantages of capacitive transducers. Derive the   10
expression of sensitivity of a capacitive transducer.

4(a)   Explain the working principle of photovoltaic transducer. Write down the functions of   10
MPPT in photovoltaic transducer.

4(b) Write short notes on: i) Thermistor ii) Photo-junction transducer and iii) Smoke detector. 15

4(c) What is meant by data acquisition? Briefly explain the digital data acquisition system. 10

SECTION-B

5(a) Define control system. Explain open loop and closed loop control system with block diagram. 10

5(b) Show that the transient response of an underdamped system is $C_{tr} = Ae^{at}\sin(\varphi + wt)$ 15

5(c) Design the value of gain K for the feedback system in the following figure so that the system will response with 5% overshoot. 10
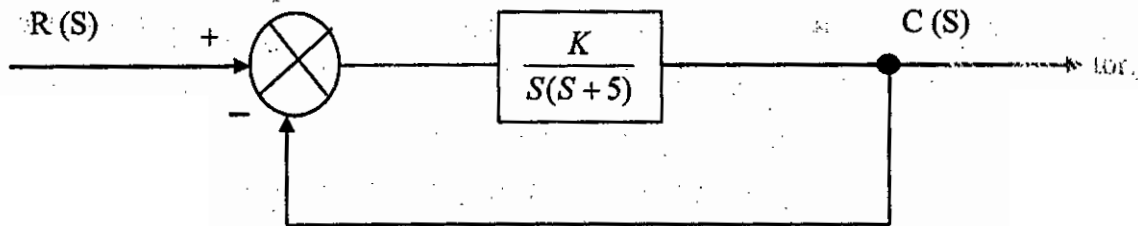
Fig: 5(c)

6(a) Find the poles and zeros from the following differential equation. 10

$$\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = 2\frac{du}{dt} + 1$$

6(b) Characteristic equation of a system is given by $Q(s) = S^4 + S^3 + 2S^2 + 2S + 5$. Apply Routh Stability Criterion to determine whether the system is stable or unstable. Find out the no. of poles in the right half plane, left half plane & imaginary axis. 15

6(c) A system is represented by the block diagram as shown in following figure. Reduce the block diagram to a single transfer function block. 10
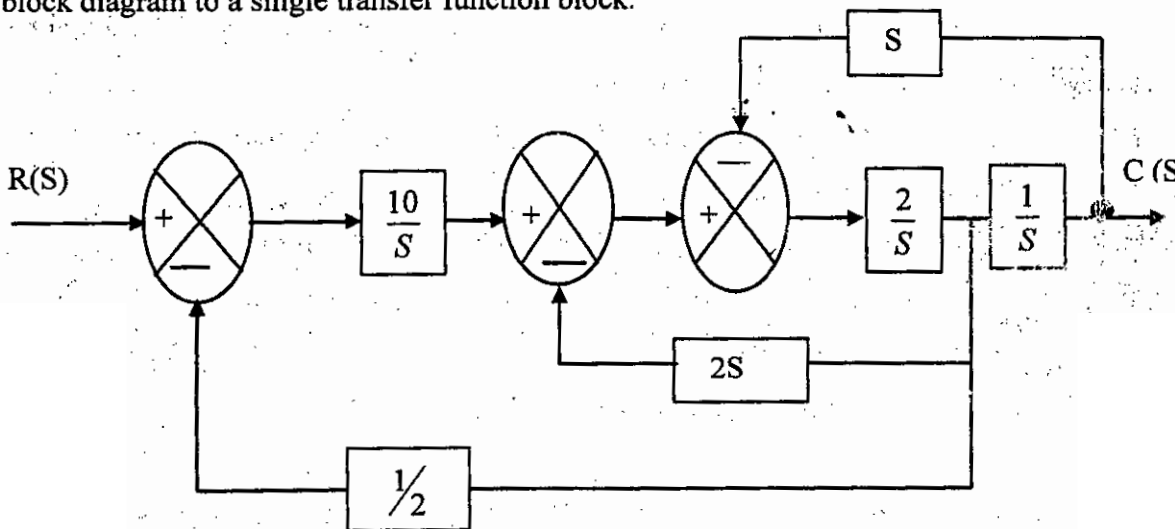

Fig : 6(c)

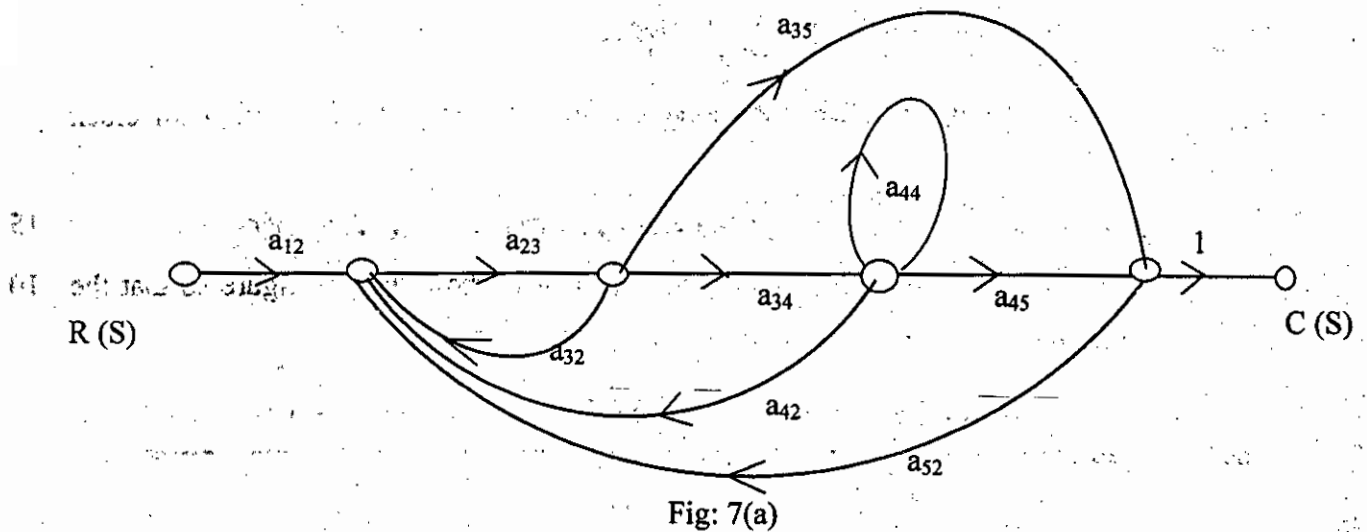7(a) For the SFG as shown in below figure, Find out the overall transmittance of the system. 12

Fig: 7(a)

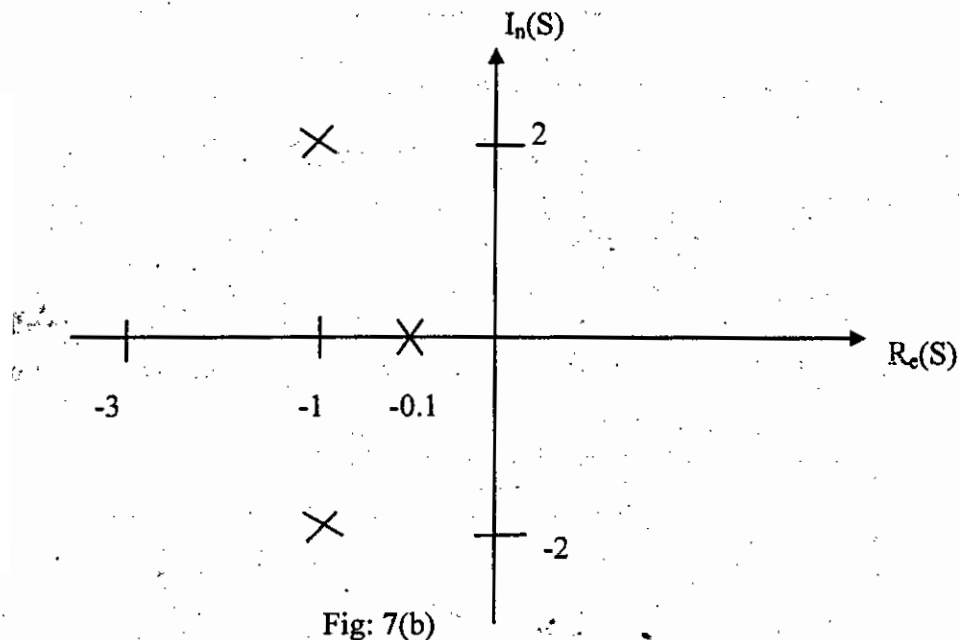7(b) Comment on the response from the Pole-Zero diagram shown in the following figure. 10

Fig: 7(b)

7(c) Find out the damping ratio, undamped natural frequency, damped natural frequency, damping co-efficient and setting time. Comment on system stability and damping nature of the system whose closed loop transfer function is $\dfrac{10}{4s^2 + 13s + 20}$. 13

8(a) Define automatic controller. Describe PD and PID controller. 10

8(b) What is the difference between microprocessor and microcontroller? Draw the bus architecture of 8085 microprocessor. 10

8(c) Define Power Electronics. 03

8(d) What is PLC? What does PLC consist of? Write down the advantages of using PLC. 12

--) END (---