KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 1st Year 1st Term Examination, 2019
HUM 1121
(Sociology and Economics)
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 is sociology?	05
1(b)	What are the differences between society and community?	15
1(c)	Discuss the role of different agents for socialization.	15
2(a)	What is social structure?	05
2(b)	Narrate the present social structure of Bangladesh.	15
2(c)	How does cultural diffusion occur?	15
3(a)	What is cultural lag?	05
3(b)	Define ethnocentrism and cultural relativism.	15
3(c)	Show the consequences of industrial revolution.	15
4(a)	What is urbanization?	05
4(b)	Narrate major urban social problems in Bangladesh.	15
4(c)	Discuss the effect of over population in our environment.	15

SECTION-B

5(a) Define Economics. Distinguish between Microeconomics and Macroeconomics.   15

5(b) Draw a production possibilities frontier for a society that produces food and   20
clothing. Show an efficient point, and the effects of a drought.

6(a) Pharmaceutical drugs have an inelastic demand, and computers have an elastic   20
demand. Suppose that technological advance doubles the supply of both products
(i.e. the quantity supplied at each price is twice what it was). What happens to
equilibrium price and quantity in each market?

6(b) Which products do experience a larger change in both price and quantity?   15
Explain with appropriate figure.

7(a) What is utility? Explain the relationship between total utility and marginal utility.   15

7(b) What is meant by a competitive firm? Under what conditions will a firm exit   20
from market? Explain.

8(a) What is GDP? Why do economists use real GDP rather than nominal GDP to   15
      forecast economic well-being? Explain.

8(b) What is national, private and public savings? Describe a tax-code that might   20
      increase private savings. If this policy was implemented, how would it affect the
      market for loan-able funds?

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 1ˢᵗ Year 1ˢᵗ Term Examination, 2019
Math-1121
(Mathematics-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.
iii) Assume reasonable data if missing any.

SECTION-A

1(a)   A function $f(x)$ is defined as follows: 10

$$f(x)= \begin{cases} 2x-1 & when & x \geq 1 \\ 1 & when & 0 \leq x < 1 \\ 1-2x & when & x < 0 \end{cases}$$

Examine the continuity and differentiability of $f(x)$ at $x=0$.

1(b)   A man is walking at the rate of 5km per hour towards the foot of a building 16m high.   12

At what rate is he approaching the top when he is 12m from the foot of the building?

1(c)   Evaluate $\lim\limits_{x \to 0} \dfrac{e^x - e^{-x} - 2x}{x - \sin x}$.   05

1(d)   Differentiate $3 \cot^{-1}(\dfrac{x}{\sqrt{1-x^2}})$ with respect to $2\tan^{-1}(\dfrac{2x}{1-x^2})$.   08

2(a)   If $y = \dfrac{x}{x^2 - 4x + 3} + 2\sin 4x$, then find y_n.   12

2(b)   State Leibnitz's theorem. If $y=\cos(a\cos^{-1}x)$ then find a relation connecting y_n, y_{n+1} and   12

y_{n+2}.

2(c)   Given $xy=4$, find the maximum and minimum values of $4x+9y$.   11

3(a)   State Rolle's theorem and verify it for the function   12

$f(x)= (x+1)(x-3)(x-4)$ in $-1 \leq x \leq 3$.

3(b)   If $U =f(r)$ and $r^2= x^2+y^2+z^2$ then find the value of   12

$$\frac{\delta^2 U}{\delta x^2} + \frac{\delta^2 U}{\delta y^2} + \frac{\delta^2 U}{\delta z^2}$$

3(c)   Expand $2x^3+7x^2+x-1$ in powers of $(x-2)$.   11

4(a)   Determine all the asymptotes of the curve $y^2x^2-4yx^2-6xy^2+3x^2-7y^2+2x+3y = 2$.   12

4(b)   Find the radius of curvature of the curve $9x^2+16y^2 = 25$ at $(1, 1)$.   11

4(c)   If α and β are the intercepts on the axes of x and y cut off by the tangent to the curve   12

$\dfrac{x^n}{a^n} + \dfrac{y^n}{b^n} = 1$, then show that $(\dfrac{a}{\alpha})^{\frac{n}{n-1}} + (\dfrac{b}{\beta})^{\frac{n}{n-1}} = 1$.

SECTION-B

5. Integrate the followings-

   5(a). $\int \tan^{-1}\sqrt{x}\, dx.$ 12

   5(b). $\int \dfrac{dx}{4+5\sin x}.$ 11

   5(c). $\int \dfrac{dx}{x^4+1}.$ 12

6. Evaluate the followings-

   6(a). $\int_0^1 \dfrac{\log(1+x)}{1+x^2}\, dx.$ 13

   6(b). $\int_0^{\pi} \log(1+\cos x)dx.$ 12

   6(c). $\lim_{n\to\infty}\left[\dfrac{n}{n^2+1}+\dfrac{n}{n^2+2^2}+\ldots\ldots\ldots\dfrac{1}{2n}\right].$ 10

7(a) Evaluate $\int_0^{\infty} e^{-2x^2} x^2\, dx.$ 11

7(b) Evaluate $\int_0^1 x^4(1-x^2)^{3/2}\, dx.$ 11

7(c) Obtain a reduction formula for $\int \sin^m x \cos^n x\, dx.$ 13

8(a) Find the inverse matrix of A by elementary transformation if exists where 10

$$A=\begin{pmatrix} 4 & 3 & 3 \\ -1 & 0 & -1 \\ -4 & -4 & -3 \end{pmatrix}.$$

8(b) Find rank of the following matrix. 08

$$\begin{pmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 0 & 2 & -8 \end{pmatrix}$$

8(c) Test the vectors $(1, 2,-3)$, $(1,-3,2)$ and $(2,-1,5)$ are linearly dependent or independent. 07

8(d) If possible, find the solution of the following system of linear equations with the help 10
of matrix

$$3x-y+5z = 1$$
$$2y-4z = 2$$
$$6x-2y+3z = 0.$$

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 1st Year 1st Term Examination, 2019
TE 1123
(Polymer Engineering)

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 is polymer? Write down the importance of polymer science.   10

1(b)   Write down the classification of polymer on the basis of geometrical structure.   08

1(c)   Write short notes on the following terms: 09

   (i) DP, (ii) Repeat unit, and (ii) End group.

1(d)   How can the fiber forming polymer be differentiated from ordinary substance?   08

2(a)   Define polymerization. Write down the properties of chain polymerization.   06

2(b)   Discuss cationic polymerization process with example.   14

2(c)   State the conditions of step polymerization.   07

2(d)   Write short notes on the below items: 08

   (i) AA-BB, and (ii) A-B type of self condensation polymerization.

3(a)   What is softening point temperature? Briefly describe the measuring process temperature   12

   of polymer.

3(b)   What is T_m and T_g ? Depict the graphical representation of T_g and T_m.   08

3(c)   Discuss the factors that influence the glass transition temperature of polymer.   10

3(d)   What is glassy solid? Describe this with relevant figure.   05

4(a)   Compare between chain end and random degradation.   06

4(b)   Mention the factors considered for polymer degradation.   06

4(c)   Discuss about oxidative and aminolytic degradation.   09

4(d)   Write short note on anti-oxidant   05

4(e)   Write the structure and end uses of following polymers: 09

   (i) PVC , (ii) Nylon 6:6 , and (iii) Polyethylene terephthalate

SECTION-B

5(a)   What is the difference between polymer and oligomer? What kinds of problem can occur   08

   due to presence of oligomer in synthetic fibers and how it can be solved?

5(b)   Mention the names of different polymerization techniques. If you want to produce a   12

   polymer that can be possible by two ways such as bulk and suspension polymerization

   technique, which process do you think more convenient and why? Explain with proper

   reasons.

5(c) What is meant by plasma? How does plasma induce polymerization on the substrate? Describe with chemical reaction.　10

5(d) What is interfacial polymerization? Why polymerization technique of Nylon 6,6 is called interfacial polymerization?　05

6(a) If the value of Polydispersity index(PDI) is greater than 1 for a polymer, what is meant by this value? Explain.　05

6(b) "Solid phase polymerization enables higher molecular weights to be reached which are either technically or commercially not feasible in the melt phase"-What is meant by solid phase polymerization? How does the solid phase polymerization do that? Explain the process.　10

6(c) Describe the Vapor pressure osmometry method for determining the molecular weight of polymer with necessary figure and equation.　13

6(d) Calculate the weight average molecular weight of a polymer sample comprising of 10 moles of polymer molecules having molecular weight of 30,000 gm/mol and 8 moles of polymer molecules having molecular weight of 50,000 gm/ mol.　07

7(a) What is super cool liquid and pseudo solid?　08

7(b) Write down the factors that control the crystallinity of polymers.　10

7(c) What is crystallinity? Write down its effect on the polymer properties.　10

7(d) Write short note on spherulilte structure of polymer.　07

8(a) What is polymer processing? Discuss one technique of polymer processing.　13

8(b) Write the name of processing techniques used for thermoset and thermoplastic polymer.　04

8(c) If you make high performance fiber, which spinning process do you apply? Describe with proper diagram.　06

8(d) Why extruder is used for synthetic polymer processing in spinning line? Sketch the screw of extruder and mention the parts which have direct influence on the productivity of polymer.　12

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 1st Year 1st Term Examination, 2019
ME 1121
(Fundamentals of Mechanical Engineering)
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) Steam table will be given on request for necessary data.

SECTION-A

1(a) Define: i) System, ii) Cycle, and iii) Process.   09

1(b) State the Zeroth law of thermodynamics. Explain-"Work is a path function".   10

1(c) A quantity of gas has volume of 0.14 m³, pressure 1.5 bar and a temperature 102°C. If the   16
gas is compressed at a constant pressure until its volume becomes 0.11m³. Determine

(i) The temperature at the end of compressor,

(ii) Work done in compressing the gas,

(iii) Decrease in internal energy, and

(iv) Heat given out by the gas.

(Assume Cp = 1.105 kj/kgk and Cv=0.712 kJ/kgk and R=285 j/kgk).

2(a) State two statements of second law of thermodynamics. Briefly explain the statement   12
"PMM-II violates the 2nd law of thermodynamics but does not 1st law of
thermodynamics".

2(b) Show that the internal energy of a closed system will remain unchanged when the system   08
is isolated from surroundings.

2(c) A chamber of constant volume of 0.6m³ contains 3.5kg of gas at 22°C having   15
Cp = 1.87 kj/kgk and Cv=1.50 kj/kgk. The heat is given to the gas until the temperature
becomes 100°C. Determine (i) the molecular mass and gas constant of the gas, (ii) the
work done, (iii) heat transfer, and (iv) change in internal energy.

3(a) Draw the P-V and T-S diagram of Diesel cycle and Otto cycles. Also, mention the   10
processes within the cycles.

3(b) Discuss the working principles of a 4-stroke cycle petrol engine with neat sketches.   12

3(c) Derive the expression for thermal efficiency of Diesel cycle.   13

4(a) Write down the boiler classification based on different parameters.   12

4(b) What are the basic differences between boiler mounting and accessories?   05

4(c) Write down the functions of fusible plug and safety valve.   04

4(d) The following observations were made in a boiler trial: 14
Coal used 250kg of calorific value 29,850 kj/kg, water evaporated 2,000kg, steam
pressure 12.5 bar, dryness fraction of steam 0.95 and feed water temperature 35.5°C.

Calculate (i) Equivalent evaporation, and (ii) the efficiency of the boiler.

SECTION-B

5(a) Define tonne of refrigeration. What are the properties of good refrigerant? 06

5(b) How does vapor absorption refrigeration system work? Explain with block diagram. 15

5(c) Refrigerant R134a is the working fluid in an ideal vapor compression refrigeration cycle. 14
The refrigerant leaves the evaporator at −25°C and has a condenser pressure 10 bar. The
mass flow rate is 3kg/min. Find C.O.P_R , and the tonnes of refrigeration.

6(a) Sketch and explain the working principle of reciprocating compressor. 12

6(b) Draw the P-V and T-S diagram of a closed cycle gas turbine with (i) reheater, and (ii) 10
inter cooler. Which one is more effective and why? Explain.

6(c) In an oil gas turbine installation, air is taken at pressure of a 1 bar and 27°C and 13
compressed to a pressure of 4 bar. The oil with a calorific value of 42,000 kj/kg is burnt in
the combustion chamber to raise the temperature of air to 550°C. If the air flows at the
rate of 1.2 kg/s; find the net power of the installation. Also find air-fuel ratio. (Assume
C_p=1.05 kj/kgk.)

7(a) What is thermal conductivity? What are the differences between heat transfer and 06
thermodynamics?

7(b) Describe an expression for the temperature distribution of a composite wall consisting of 15
two different materials having thermal conductivity of K_1 and K_2 respectively.

7(c) The walls of a room consists of parallel layers in contact of cement, brick and wood of 14
thickness 20mm, 300mm, and 10mm respectively. Find the quantity of heat that passes
through each m^2 of wall per minute, if the temperature of air in contact with the wall is
5°C and 30°C inside.

8(a) Distinguish between the centrifugal pump and reciprocating pump. 07

8(b) Differentiate between film and dropwise condensation. 06

8(c) Define; (i) Black body, (ii) Emissivity,(iii) White body, (iv) Transmissivity, and (v) 13
Reflectivity.

8(d) State and explain Wien's displacement law of radiation. 09

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering
B. Sc. Engineering 1st Year 1st Term Examination, 2019
Ch 1121
(Chemistry- 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)   Define photochemical and thermal reactions with examples.   08

1(b)   State and explain the laws of photochemistry.   10

1(c)   What is quantum yield? What are the causes of high and low quantum yield?   10

1(d)   One mole reactants give 10 moles of products in a photochemical reaction. Calculate the   07
       energy associated with the reaction.

2(a)   Define metallic bonding, hydrogen bonding, and co-ordination bonding.   09

2(b)   Discuss the electron sea model of metallic bonding.   10

2(c)   Chemically explain the following statement: 06
       "Ice floats on water".

2(d)   What is meant by diamagnetism and paramagnetism? Mention the magnetic nature of N_2 10
       molecule.

3(a)   What are the colloids? Mention the nature of lyophilic and lyophobic colloids.   08

3(b)   Write an essay on the application and importance of colloids in our daily life.   10

3(c)   Explain the terms electrophoresis and electro-osmosis.   08

3(d)   What is gold number? Explain the reasons of origin of charges in colloids.   09

4(a)   Illustrate the Lewis and Lux-Flood concept of acids and bases.   10

4(b)   Define buffer. Explain the capacity of an acidic buffer solution.   09

4(c)   The dissociation constants of formic acid and acetic acid are 21.4×10^{-5} and 1.81×10^{-5} 08
       respectively. Find the strengths of the acids.

4(d)   "Water can act both as an acid and a base". Explain.   08

SECTION-B

5(a)   Define the following terms   09
       (i) Redox reaction, (ii) F.. energy, and (iii) Concentration cells.

5(b)   What is EMF? Derive Nernst equation for determining EMF.   10

5(c)   Determine the equation of pH of a solution by using standard hydrogen electrode.   10

5(d)   Predict whether the reaction   06
       $2 Ag(s) + Zn^{2+}(aq) \rightarrow Ag^{+}(aq) + Zn(s)$ is feasible or not.
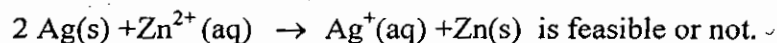
       Given, $E^0_{Ag/Ag^+} = 0.80V$ and $E^0_{Zn^{2+}/Zn} = -0.763V$.

6(a)   Explain crystal field theory for octahedral fields.   09

6(b) . What is EAN rule? Calculate the EAN of the central atom in the following complex   08
        species:

        i) $[Cu(CN)_4]^{3-}$

        ii) $[Pt(NH_3)_2Cl_2]$

        iii) $[Fe(CN)_3]^{3-}$

6(c)   Shortly discuss the geometric isomerism and optical isomerism of complex compound   08
        with examples.

6(d)   Write down the comparison between VBT and CFT.   10

7(a)   State Raoult's law and Henry's law.   10

7(b)   What are the colligative properties and why are they so called?   08

7(c)   Outline a method for determining the molar mass of a non-volatile solute by the relative   10
        lowering in vapor pressure of the solvent.

7(d)   What is istonic solution? Calculate the osmotic pressure of a 5% solution of glucose (mol   07
        wt. =180) at 18°C.

8(a)   Define the following terms with examples: 09

        (i) Hydrolysis, (ii) Aminolysis, and (iii) Nucleophile.

8(b)   What is activation energy? Explain exothermic and endothermic reactions giving energy   08
        diagram.

8(c)   What are catalyst and catalysis? Discuss the classification of catalyst with appropriate   08
        examples.

8(d)   State the Kohlrausch's law. How can you determine the Λ_0 of weak electrolytes using the   10
        law?

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