KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Textile Engineering

B. Sc. Engineering 1st Year 1st Term Examination, 2016

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.

SECTION-A

1(a)	Define i) System ii) Process and iii) Cycle.	09
1(b)	Describe different types of thermodynamic system with necessary figures.	06
1(c)	Derive the relation $Cv=\frac{R}{r-1}$, where Cv is specific heat at constant volume, r is adiabatic index and R is gas constant.	07
1(d)	A system contains 0.15 m^3 of a gas at a pressure of 3.8 bar and 150°C. It is expanded adiabatically till the pressure falls to 1 bar. The gas is then heated at a constant pressure till its enthalpy increases by 70 KJ determine the total work done. Take Cp = 1 kJ/kg.K and Cv=0.714 kJ/kg.K.	13
2(a)	State and explain Zeroth law of thermodynamics.	08
2(b)	Explain the term: i) Quasi static process and ii) Energy.	06
2(c)	What is PMM1? Is it possible or not? Explain.	06
2(d)	What is isentropic process? Define the relation of work done in an isentropic process.	15
3(a)	Classify I.C. engine. Write down the advantages and disadvantages of an IC engine.	09
3(b)	Describe working principle of a 4-stoke cycle petrol engine.	09
3(c)	A four stroke engine has 4-cylinders. The diameter of piston is 10 cm, stoke length is 15 cm. Indicated means effective pressure is 0.67 MPa. The speed of the engine is 2000 rpm when the number of explosion is 980 per min. Brake torque is 181.5 N-m. Fuel consumption by the engine recorded as 11.89 kg/hr. Calorific value of the fuel used is 41800 kJ/kg. Given the relative efficiency is 0.5. Find:- i) Mechanical efficiency ii) Brake thermal efficiency and iii) Air standard efficiency.	17
4(a)	Draw the P-V and T-S diagram of i) Bryton cycle ii) Dual cycle and iii) Diesel cycle.	06
4(b)	Draw the expression for thermal efficiency of an otto cycle.	12
4(c)	Describe the working principle of a reciprocating pump.	10
4(d)	Differentiate between petrol and diesel engine.	07

SECTION-B

5(a)	What is meant by refrigeration? Write down the application of it.	06
5(b)	Define (i) Coefficient of performance and (ii) Ton of refrigeration.	06
5(c)	What are the properties of a good refrigerant? Write down the name of some common refrigerants.	08
5(d)	Describe the working principle of a vopour compression refrigeration system with neat sketch.	15
6(a)	Define i) Humidity ii) Dew point temperature and iii) Dehumidification process.	09
6(b)	Define human comfort. Describe the factors affecting comfort air conditioning.	09
6(c)	Describe the working principle of a summer air conditioning system with neat sketch.	11
6(d)	What are the basic elements of an air conditioning unit? Write down some applications of air conditioning.	06
7(a)	What is meant by steam generator? Why boiler mountings and accessories are used in steam generator?	07
7(b)	What are the factors that should be considered during selection of a steam boiler?	07
7(c)	Write down the function of the followings in a steam boiler:- i) Safety valve ii) feed pump iii) Air preheater iv) Economizer.	08
7(d)	Describe the working principle of a vertical multi tubular boiler.	13
8(a)	Define different modes of heat transfer? Explain the general formula of different modes of heat transfer.	09
8(b)	Explain the terms i) Black body and ii) Gray body? State and explain Kirchoff's law.	10
8(c)	Consider slab of thickness L. The boundary surface at x=0 and x=L are maintained at constant but different temperature T_1 and T_2 respectively. There is no energy generation in the solid and the thermal conductivity k is constant. Develop an expression for the temperature distribution $T_{(x)}$ in the slab and the thermal resistance of the slab for the heat flow through an area A.	16

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Textile Engineering

B. Sc. Engineering 1st Year 1st Term Examination, 2016

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)	Define sociology and Society.	05
1(b)	Explain the subject matter of sociology.	10
1(c)	Explain different types of societies with their distinctive characteristics.	20
2(a)	Differentiate between "Association" and "Institution".	10
2(b)	What is social structure? What are the elements that shape social structure?	10
2(c)	Discus the relationship among the industrialization, urbanization and urban ecology.	15
3(a)	What is culture and what are the taxonomy?	10
3(b)	Differentiate between subculture and counter culture?	10
3(c)	Explain the elements or carriers of culture.	15
4(a)	Distinguish between culture and civilization.	10
4(b)	Explain "Urbanism" as a way of life.	10
4(c)	What are the Empirical consequences of urban living?	15

SECTION-B

5(a)	Define Economics. Distinguish between Microeconomics and Macroeconomics.	10
5(b)	Draw and explain a production possibilities frontier that produces food and clothing. Show the effects of a drought in your PPF.	20
5(c)	Explain the term "opportunity cost" with the PPF.	05

6(a) Suppose, the cost of producing stereo systems has fallen over the cost several decades. Now, use a supply-and-demand diagram to show the effect of falling production cost on the price and quality of stereos sold. 15

6(b) In your diagram show what happens to consumer surplus and producer surplus? 10

6(c) Suppose, the supply of stereos is very elastic, who gets benifits most from falling production cost-consumers or producers of stereos? Explain . 10

7(a) What is meant by a competitive firm? Briefly discuss the types of markets other than perfectly competitive market. 10

7(b) Draw the cost curves for a typical competitive firm. For a given price, explain how the competitive firm chooses the level of output that maximizes profit. 15

7(c) Under what conditions will a firm shut down temporily? Explain. 10

8(a) Define real and nominal GDP. Which is the better measure of Economic well-being? Why? 10

8(b) In the year 2011, the economy produces 1000 units of pen that sell TK-5 each. In the year 2012 the economy produces 1500 units of pen and that sell at TK-7 each. And year 2013 the economy produces 2000 units of pen that sell at TK-10 each. Calculate nominal GDP, Real GDP and the GDP deflator. For each year (Use 2011 as base year). By what percentage does each of these three statastics rise from one year to the next? 15

8(c) What is investment? How is it related to national saving? 10

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B. Sc. Engineering 1st Year 1st Term Examination, 2016

CH 1121

(Chemistry-I)

Time: 3 Hours | Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.
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SECTION-A

1(a)	Distinguish between electronic and electrolytic conduction.	06
1(b)	State the kohlrausch's law. How can you determine the Λ_0 of weak electrolytes using the law?	12
1(c)	What is meant by Relaxation effect and Electrophoretic effect? Write down the Debye-Huckel-Onsager conductance equation and make a schematic plot of Λ vs $\sqrt{C}$ for NaCl and $AgNO_3$ solution.	12
1(d)	What is meant by transport number of an ion?	05
2(a)	Draw and explain an electrochemical cell of Galvanic type and Electrolytic type. Write down the sign convention and types of reaction of these cells.	09
2(b)	What is glass electrode? How can it be used in measuring p^H of a solution?	08
2(c)	What is salting out effect? Discuss the suitable factors that enhance the corrosion of building in khulna region.	09
2(d)	What is corroded centre? Discuss the electrochemical mechanism of corrosion with suitable diagram.	09
3(a)	What is meant by true solution, colloidal solution and suspension solution.	06
3(b)	What is Tyndall effect? "True solutions do not show Tyndall effect"- Explain this statement.	07
3(c)	What is coagulation of colloid? Name the factors that determine the rate of coaguation. What is Hardy-Schulze rule?	12
3(d)	What is meant by dialysis? Why is it necessary?	10
4(a)	What is meant by collegative properties and why are they so called?	07
4(b)	Discuss Van't Hoff theory of dilute solutions. What is Van't Hoff factor?	10
4(c)	What is meant by quantum yield of photochemical reaction? What are the causes of high and low quantum yield?	10
4(d)	Explain briefly fluorescence and chemiluminescence.	08

SECTION-B

5(a) "HCl is a Bronsted acid, cannot be called a Lewis acid"- Explain this statement with suitable example. 10

5(b) What is meant by buffer solution and buffer action? Explain clearly why a solution of weak acid and its salt with a strong base behaves as a buffer solution. 10

5(c) What is acid-base indicator? Explain giving reason which indicator is the best for the titration of NH_4OH and HCl. 10

5(d) Calculate the P^H of a buffer solution containing 0.1 mole of acetic acid and 0.01 mole of sodium acetate per Litre. (k_a=1.84x10^{-5}). 05

6(a) Write down the reaction and uses of derivatives when cellulose reacts with acid and base. 08

6(b) Give the orbital diagram for the CO molecule according to MOT. What is the bond order of CO? Is the molecule dia-magnetic or paramagnetic? 12

6(c) "CH_4, NH_3, and H_2O all have SP^3 hybridization at the central atom, but their bond angles are different"-Why? 08

6(d) What is H-bonding? How does intermolecular and intramolecular H-bonding influence the properties of the compounds? 07

7(a) State EAN rule. Calculate the EAN of the following comlexes: 08

(i) $[Ag(NH_3)_4]^+$ and (ii) $[Cr(NH_3)_6]^{3+}$, Here atomic numbers of Ag and Cr are 47 and 24 respectively.

7(b) What are the fundamental postulates of Werner's theory of coordination compounds? Explain the terms 'Secondary' and 'Primary' valencies of Werner's theory giving examples. 13

7(c) Give the IUPAC name of the following complexes: 06

(i) $[Co(H_2O)_6]Cl_2$ and (ii) $K_4[Fe(CN)_6]$

7(d) $[Fe(CN)_6]^{3-}$ is an inner orbital complex, while $[FeF_6]^{3-}$ is an outer orbital complex-explain. 08

8(a) Explain the following terms with suitable examples: i) Exothermic reaction ii) Aminolysis, and iii) Chain reaction 12

8(b) "N_2 is diatomic but Ne is monotomic"- Explain with the help of MOT. 10

8(c) What is carbocation? Why tertiary carbonium ions are more stable than primary carbonium ions? 08

8(d) What are the effects of catalysis on a chemical reaction? 05

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B. Sc. Engineering 1st Year 1st Term Examination, 2016

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)	Define: Polymer, Monomer and Repeat unit.	06
1(b)	Classify polymer based on line structure and tacticity.	12
1(c)	Write the monomer and repeat unit of the following polymers: i) Polyethylene ii) PVC iii) Polyestyrene iv) Nylon	12
1(d)	Why polymers are unique?	05
2(a)	Show the relation between average degree of polymerization and extent of reaction.	06
2(b)	Discuss the method of free radical polymerization with example.	15
2(c)	Distinguish between chain and step polymerization.	08
2(d)	Define with examples: i) Telomer ii) Retarder iii) Inhibitor	06
3(a)	How can the molecular weight of the product in step polymerization be controlled?	05
3(b)	Distinguish between chain growth and step growth polymerization.	10
3(c)	What is meant by self condensation polymerization?	05
3(d)	Discuss the types of step polymerization.	15
4(a)	What is polymer degradation? When and why polymer suffers degradation?	06
4(b)	How can degradation of polymer be controlled? Describe about anti-oxidants.	07
4(c)	Discuss the types of polymer degradation.	10
4(d)	Describe suspension polymerization. Why it is called bead or pearl polymerization?	12

SECTION-B

5(a)	What is super cool liquid and pseudo liquid?	06
5(b)	Write about the properties of crystalline solid.	07
5(c)	What is meant by degree of crystallinity? Why some polymers are highly crystalline and some are highly amorphous?	12
5(d)	Compare between the properties of crystalline and amorphous polymer.	10
6(a)	Define Tg and Tm. What are the factors that influence Tg? Explain it.	08
6(b)	Explain Tg of copolymers. Discuss the polymer behavior below and above Tg.	12
6(c)	Mention the effects of temperature on polymer.	09
6(d)	Why melt viscosity of injection moulding is important?	06
7(a)	What is Polydispersity index (PDI)? What can be inferred from PDI?	06
7(b)	Give the mathematical expressions for $\overline{Mn}$ and $\overline{Mw}$.	14
7(c)	Calculate the number average and weight average molecular weight of a polymer sample comprising of 09 moles of polymer molecules having molecular weight of 30,000 gm/mol and 5 moles of polymer molecules having molecular weight of 50,000 gm/mol.	15
8(a)	Why tensile strength, impact strength and chemical resistivity of a polymer increases with the increase of molar mass?	09
8(b)	Differentiate between number average and weight average molecular weight.	06
8(c)	What are the different types of polymer molecular weight? Give the equation for each type.	10
8(d)	What are the properties dependent on polymer molecular weight? Sketch the graph of molecular weight Vs polymer properties.	10

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SECTION-B

Calculate any three of the followings: 35

5(a) $\int \frac{dx}{2+3\cos x+\sin x}$

5(b) $\int \frac{e^x}{e^x-3e^{-x}+2}\,dx$

5(c) $\int \sqrt{(2x+1)/(3x+2)}\ dx$

5(d) $\int \frac{dx}{(x+1)\sqrt{1+2x-x^2}}$

Evaluate any three of the followings: 35

6(a) $\int_0^{\frac{\pi}{2}} \frac{dx}{5+4\cos x}$

6(b) $\int_0^{\pi} \frac{x\sin x}{1+\cos^2 x}\,dx$

6(c) $\int_0^{\frac{\pi}{2}} Log\,(\tan x+\cot x)\,dx$

6(d) $\int_0^1 x^4(1-x^2)^{1/2}\ dx$

7(a) Define Gamma and Beta functions. Prove that $\int_0^{\frac{\pi}{2}} \sin^p\theta\cos^q\theta\ d\theta = \frac{\frac{p+1}{2}\ \frac{q+1}{2}}{2\ \frac{p+q+2}{2}}$ 13

7(b) Obtain reduction formula for 12

$\int sec^n x\,dx$, *hence find* $\int sec^5 x\,dx$

7(c) Find the inverse of the matrix A, if exists 10

Where A = $\begin{bmatrix}1 & 3 & 3\\ 1 & 4 & 3\\ 1 & 3 & 4\end{bmatrix}$; By using elementary row transformations.

8(a) Reduce matrix A to its normal form and then find its rank. 12

Where A= $\begin{bmatrix}1 & 2 & 3\\ 2 & 3 & 4\\ 3 & 5 & 7\end{bmatrix}$

8(b) Solve the following system of linear equations. 12

x + y + z = 6

2x+3y-2z= 2

5x+y+2z = 13

8(c) Determine whether the vectors u,v and w are linearly dependent or independent, where u = (1, 1, -1) , v = (2, -3, 1) and w =(8, -7, 1) 11

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