

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Textile Engineering

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

TE 1121

(Textile Fibers)

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 textile fiber? | 15 |
| 1(b) | Classify the textile fibers with example. | 15 |
| 1(c) | Describe the different physical properties of textile fiber. | 05 |
| 2(a) | What is ginning? | 05 |
| 2(b) | Mention the grading system for cotton and jute. | 20 |
| 2(c) | Differentiate between lint and linters. | 10 |
| 3(a) | What is bast fiber? | 05 |
| 3(b) | Discuss about morphological diagram of cotton fiber with chemical composition. | 20 |
| 3(c) | Why cotton is called versatile fiber? | 10 |
| 4(a) | What is difference between wool and hair fiber? | 08 |
| 4(b) | What are the types of wool fibers? | 10 |
| 4(c) | Why merino wool is the best? | 10 |
| 4(d) | What is garneting? | 07 |

SECTION-B

- | | | |
|------|--|----|
| 5(a) | What is spinneret? Describe the melt spinning process of fiber with neat sketch. | 15 |
| 5(b) | Compare among melt, wet and dry spinning process. | 15 |
| 5(c) | State the requirement for fiber formation. | 05 |
| 6(a) | Classify the regenerated fibers. Why rayon is called regenerated cellulosic fiber? | 10 |
| 6(b) | State the various steps involved in viscose process. | 15 |
| 6(c) | Write the physical & chemical properties of polyester fiber. | 10 |
| 7(a) | Describe the manufacturing process of Nylon 6.6 | 15 |
| 7(b) | Depict the manufacturing procedure of polyester fiber. | 15 |
| 7(c) | What is polyamide fiber? | 05 |
| 8(a) | What is elastomeric fiber? Show the production process of spandex. | 15 |
| | Write the trade name and country of origin for the following fibers:- | 10 |
| 8(b) | (i) Glass fiber (ii) Polyester (iii) Nylon and (iv) Viscose fiber. | |
| 8(c) | Write short notes on:- | 10 |
| | (i) Carbon fiber and (ii) Cavler fiber. | |

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Textile Engineering

B. Sc. Engineering 1st Year Backlog 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) What is community? What are the pre-conditions of a community? 10
1(b) Discuss the scope of sociology. 10
1(c) Write down the importance of sociology giving emphasis on Textile Engineering. 15
- 2(a) Explain social structure and its basic elements. 10
2(b) Why human societies are stratified? 10
2(c) Explain the bases of human behavior. 15
- 3(a) What is social change? 10
3(b) Discuss the main factors of social change. 10
3(c) What are effects of technological factors on social life? 15
- 4(a) Explain urbanism and its consequences. 10
4(b) What is urban process? Explain concentric zone model with examples. 10
4(c) How will population growth affect global ecology? 15

SECTION-B

- 5(a) Explain the idea of "Economics", "Microeconomics" and "Macroeconomics". 15
5(b) Discuss the importance of studying Economics as a student of Textile Engineering Department. 20
- 6(a) What determines the quantity of a good that buyers demand? 15
6(b) What are supply schedule and the supply curve and how are they related? 10
6(c) What is competitive market? Describe the types of market other than perfectly competitive markets. 10
- 7(a) What is meant by the word "Production" in Economics? Explain the law of marginal production with example. 15
7(b) Define price elasticity of income and Cross-price elasticity. 10
7(c) Explain the cross price elasticity of demand and the income elasticity of demand. 10
- 8(a) Define GDP. Discuss the components of GDP with example. 15
8(b) Explain the idea of "Demand pull inflation" and "Cost push inflation". How does the Govt. control the inflation by fiscal measures? 20

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering

B. Sc. Engineering 1st Year Backlog Examination, 2016 (14th Batch)

TE1123

(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 the following terms: 06
(i) Polymer (ii) Monomer and (iii) Oligomer.
- 1(b) Briefly discuss the classification of industrial polymers with example. 14
- 1(c) Write down the monomer, repeat unit and polymer of the followings: 15
(i) Polyethylene (ii) Polystyrene (iii) Polyether (iv) Nylon and (v) PVC
- 2(a) What is polymerization? Classify different types of polymerization. 07
- 2(b) Differentiate between Homo-polymer and Co-polymer. 06
- 2(c) Discuss the methods of free radical polymerization with example. 15
- 2(d) Differentiate between chain and step polymerization. 07
- 3(a) Define the following terms: (i) Glass transition temperature (ii) Crystalline melting point and (iii) Flow temperature. 06
- 3(b) Show the relation between T_g and T_m . State the importance of T_g in textile. 10
- 3(c) What are the factors that influence T_g ? Explain it. 09
- 3(d) Explain T_g of copolymers. Discuss the polymer behavior below and above T_g . 10
- 4(a) What are meant by polymer degradation and aging? What are the degrading agents? 10
- 4(b) Discuss the types of polymer degradation. 12
- 4(c) Describe the oxidative degradation process of polymer. 13

SECTION-B

- 5(a) Write about the properties of crystalline solid. 10
- 5(b) Compare between the properties of crystalline and amorphous polymer. 10
- 5(c) What is meant by degree of crystallinity? Why some polymers are highly crystalline and some are highly amorphous? 15
- 6(a) What is kinetics of polymerization? State the kinetics of free radical chain polymerization. 12
- 6(b) What is polymer processing? Discuss one technique of polymer processing. 12
- 6(c) What is compounding? State the importance of compounding in polymer engineering. 06
- 6(d) Write the name of processing techniques used for thermo set and thermoplastic polymer. 05

- 7(a) What is polydispersity? Explain with example. 07
- 7(b) Sketch and describe the different zone of an extruder machine. 20
- 7(c) What is the importance of melt viscosity in injection molding? 08
- 8(a) Describe the effect of molecular weight on mechanical properties. 10
- 8(b) "Increase of molar mass increase tensile strength, impact strength and chemical resistivity"-Explain this statement. 08
- 8(c) Write down the effects of temperature on polymer. 05
- 8(d) Define following terms;- 12
- (i) Number average molecular weight.
 - (ii) Weight average molecular weight.
 - (iii) Viscosity average molecular weight.

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Textile Engineering

B. Sc. Engineering 1st Year Backlog Examination, 2016 (15th Batch)

TE1123
(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 the following terms with example: 12
(i) Polymer (ii) Monomer and (iii) Repeating unit.
- 1(b) Classify different types of polymer with example. 14
- 1(c) Write down the importance of polymer in textile. 09
- 2(a) What is meant by step polymerization? Write down its condition. 10
- 2(b) Show the relation between DP and extent of reaction. 10
- 2(c) Discuss the methods of free radical polymerization with example. 15
- 3(a) Write short notes on: 09
(i) Glass transition temperature (ii) Softening point and (iii) Flow temperature.
- 3(b) Show the relation between T_g and T_m . State the importance of T_g in textile. 12
- 3(c) Explain T_g of copolymer. Discuss the polymers behavior below and above T_g 14
- 4(a) What is polymer degradation? Discuss the types of polymer degradation. 10
- 4(b) How the degradation of polymer can be controlled? 10
- 4(c) Describe the photo-degradation process of polymer. 15

SECTION-B

- 5(a) What is super cool liquid and pseudo liquid? 08
- 5(b) Write down the factors that control the crystallinity of the polymers. 10
- 5(c) What is crystallinity? Write down its effect on the polymer properties? 17
- 6(a) Define the following terms:- 15
(i) Number average molecular weight
(ii) Weight average molecular weight
(iii) Viscosity average molecular weight
- 6(b) Calculate the number average and weight average molecular weight of a polymer sample 10
comprising of 9 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.
- 6(c) What are the properties dependent of polymer molecular weight? 10

- 7(a) What is polymer processing? Discuss one technique of polymer processing. 13
- 7(b) Write the name of processing techniques used for thermoset and thermoplastic polymer. 04
- 7(c) What is compounding? What are the importances of compounding? 06
- 7(d) Discuss one liquid phase technique of polymerization with necessary sketch. 12
- 8(a) Classify the polymerization techniques. 10
- 8(b) How the raw materials of different polymerization process can be purified? 10
- 8(c) Discuss the cationic polymerization process with example. 15

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Textile Engineering

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

Ph 1221
(Physics)

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) Describe the construction of a compound microscope and explain its action with a simple ray diagram. 13
- 1(b) What is interference of light? Discuss interference of light analytically and obtain the conditions of maximum and minimum intensities. 12
- 1(c) In Newton's rings experiment the diameter of the 15th ring was found to be 0.590cm and that of the 5th ring was 0.336 cm. If the radius of the plane convex lens is 100cm, calculate the wave length of light used. 10
- 2(a) Discuss the Fraunhofer diffraction due to a single slit and discuss the intensity distribution on the screen. 15
- 2(b) Write short notes on: (i) Brewster's law and (ii) Malu's law. 10
- 2(c) The critical angle for certain wavelength of light in the case of a piece of glass is 40°. Find the polarizing angle for glass. 10
- 3(a) What is Compton effect? Give the explanation of this effect with the help of quantum theory and an expression of the Compton shift $\Delta\lambda$. 15
- 3(b) Derive Einstein's photo-electric equation and explain the laws of photo electric emission. 10
- 3(c) The photo-electric threshold frequency of silver is 1.086×10^{15} Hz. Calculate the maximum velocity of the ejected electrons, when the silver surface is illuminated by ultra violet light of frequency 1.5×10^{15} Hz. 10
- 4(a) State and explain Heisenberg's uncertainty principle. Using uncertainty principle, explain- "why electron cannot be present in the nucleus?" 13
- 4(b) Show that in a privileged orbit the magnetic moment of the electron must be $-\left(\frac{e}{2m}\right)\bar{L}$ where \bar{L} is the angular momentum. 12
- 4(c) Find the wavelength of the spectral line that corresponds to a transition in H₂ from the n=5 state to the n=2 state. In what part of the spectrum is this? 10

SECTION-B

- 5(a) What is meant by symmetry operation? Prove that a crystal cannot have five fold symmetry. 10
- 5(b) Discuss seven crystal systems by giving one example of each and describe the various types of Bravais lattices in case of three dimensional with the help of neat and clear diagrams. 15
- 5(c) In a unit cell simple cubic structure, find the angle between the normal to pair of planes whose Miller indices are (i) [101] and [301] & (ii) [121] and [110]. 10
- 6(a) What are phonons? Express the laws of conservation of energy and momentum in the case of inelastic scattering of a photon by a phonon. 10
- 6(b) What are the assumptions of Einstein's theory of specific heat of solid? Derive relation for lattice heat capacity following Einstein model. 15
- 6(c) Calculate the maximum phonon frequency generated by scattering of visible light of wavelength $\lambda = 4880\text{\AA}$. Give that velocity of sound in medium is 3.4×10^5 cm/sec and refractive index is 1.51. 10
- 7(a) Derive an expression for the thermal conductivity from the free electron theory of metals. 13
- 7(b) Write short notes on the following : 12
(i) Additive method of color mixing and (ii) Subtractive method of color mixing
- 7(c) Find the Hall co-efficient and electron mobility for germanium if for a given sample [length 1cm, breath 4mm and thickness 1mm] a current of 5 milliamphere flown from a 1.5 volts supply develops a Hall voltage 20 millivolts across the specimen in a magnetic field of 0.45 wb/m^3 . 10
- 8(a) State and explain the principle of LASER. Write down the properties of LASER. 10
- 8(b) Give the brief outlines of the form of input energy of a LASER. Explain the terms: 15
(i) Induced absorption (ii) Spontaneous emission and (iii) Stimulated emission.
- 8(c) The coherence length of sodium light is 2.9×10^{-2} m. The wavelength of sodium light is 5896\AA . Calculate (i) the number of oscillation corresponding to the coherence length and (ii) the coherence time. 10

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Textile Engineering

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

Math 1221
(Mathematics-II)

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) Find the cylindrical polar and spherical polar co-ordination for the point $(V_3, V_3, -1)$. 08
- 1(b) Define direction cosine and direction ratios of a line. Obtain the relation between them. 15
- 1(c) A line makes angles α, β, γ and δ with four diagonal of a cube, show that $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma + \cos^2 \delta = 4/3$. 12
- 2(a) Find the equation of the plane passing through the points $(1, 0, -1)$ and is perpendicular to the plane $2x+y+z = -1$. 10
- 2(b) Find the distance of the point $(-6, 1, 21)$ from the line $\frac{x+4}{3} = \frac{y+5}{1} = z+1$. 11
- 2(c) Find the length and the equation of the shortest distance between the lines $\frac{x-4}{2} = y+2 = 3-z$ and $\frac{x+7}{3} = \frac{y+2}{2} = 1-z$. 14
- 3(a) Prove that the lines $x = ay+b, z = cy+d$ and $x = a'y+b', z = c'y+d'$ are perpendicular if $aa' + bb' = 1$. 10
- 3(b) Find the symmetrical form of the equation of a line $2x+3y+z-1=0 = x+y-2z+3$, also find its direction cosine. 10
- 3(c) Prove that the lines $\frac{x+1}{2} = \frac{y+1}{3} = \frac{z+1}{4}$ and $x+2y+3z-4=0 = 3x+4y+5z-6$ are co planer and find the coordinates of their point of intersection. 15
- 4(a) What is right circular cone? Find the equation of the cone where vertex is at origin and the axis is y-axis and semi-vertical angle is α . 13
- 4(b) A sphere has points $(6, 1, 0)$ and $(0, 1, 8)$ as the ends of one diameter. Find the equation of the sphere, its volume and surface-area. 10
- 4(c) Remove the product term from the equation $19x^2+5xy+7y^2=13$ by suitable rotation of axes. 12

SECTION-B

- 5(a) Define order and degree of differential equation with example. Obtain the differential equation for which $y = C_1 \cos x + C_2 \sin x$ is solution, where C_1 and C_2 are arbitrary constant. 12
- 5(b) Solve: $\frac{d^2 y}{dx^2} - y = \frac{2}{1+e^x}$, by the method of variation of parameter. 15
- 5(c) Solve: $dy = (4x+y+1) dx$. 08
- 6(a) Solve the differential equation: $\frac{dy}{dx} = 2 + \sqrt{y-2x+3}$ 10
- 6(b) Solve the differential equation: $xy dx + (2x^2 + 3y^2 - 20) dy = 0$. 13
- 6(c) Solve, $\frac{dy}{dx} + y = xy^3$, $y(1) = 0$. 12
- 7(a) Solve the differential equation: $y'' - 2y' - 3y = 4x - 5 + 6xe^{2x}$. 12
- 7(b) Solve, $\frac{d^2 y}{dx^2} - y = e^x + \sin^2 x$. 13
- 7(c) Solve the differential equation: $y^{(iv)} + 2y'' + y = 0$. 10
- 8(a) Find the value of the constant 'a' for what the vector $\vec{A} = (axy - z^3) \hat{i} + (a-2)x^2 \hat{j} + (1-a)xz^2 \hat{k}$ have its curl identically zero. 10
- 8(b) If $\vec{F} = 4xz \hat{i} - y^2 \hat{j} + yz \hat{k}$, evaluate the surface integral $\iint_S \vec{F} \cdot \hat{n} ds$ where S is the surface of the cube bounded by $x=0, x=1, y=0, y=1, z=0$ and $z=1$. 15
- 8(c) Find $\text{div grad } \phi$ where $\phi = 2x^3 y^2 z^4$ at the point $(-1, 2, 3)$. 10

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Textile Engineering

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

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.

SECTION-A

- 1(a) A function $f(x)$ is defined as follows: 13
- $$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2-x & \text{for } 1 \leq x \leq 2 \\ x^{-1/2} x^2 & \text{for } x > 2 \end{cases}$$
- Discuss the continuity and differentiability of $f(x)$ at $x=1$
- 1(b) The volume of a spherical balloon is increasing at the rate of $10\text{cm}^3/\text{sec}$. Find the rate of change of its radius and surface at the instant when its radius is 16 cm. 12
- 1(c) If $y = (\sin x)^{\cos x} + (\cos x)^{\sin x}$, then find $\frac{dy}{dx}$. 10
- 2(a) Find the n th derivatives of $y = \frac{1}{x^2 - 5x + 6}$. 11
- 2(b) State Leibnitz's theorem. If $\log y = \tan^{-1}x$, then find the value of $(1+x^2) y_{n+2} + (2nx+2x-1) y_{n+1} + n(n+1) y_n$. 13
- 2(c) If $u = \log r$ and $r^2 = x^2 + y^2 + z^2$, then find the value of $\frac{\delta^2 u}{\delta x^2} + \frac{\delta^2 u}{\delta y^2} + \frac{\delta^2 u}{\delta z^2}$. 11
- 3(a) State the Rolle's Theorem. Verify Rolle's theorem for the function $f(x) = x^2 - 3x + 2$ in the interval (1, 2). 11
- 3(b) State L' Hospital's theorem. 11
- Evaluate $\lim_{x \rightarrow 0} \left[\frac{x \cos x - \log(1+x)}{x^2} \right]$.
- 3(c) Discuss the maxima and minima of u , where $u = \frac{4}{x} + \frac{36}{y}$ and $x+y = 2$. 13
- 4(a) Find the tangent to the curve $xy^2 = 4(4-x)$ at the point where it is cut by the line $y=x$. 10
- 4(b) Define radius of curvature. Find the radius of curvature of the curve $y = x^3 - 2x^2 + 7x$, at the origin. 11
- 4(c) Find all the asymptotes of the curve $x^3 - 4xy^2 - 3x^2 + 12yx - 12y^2 + 8x + 2y + 4 = 0$. 14

SECTION-B

5(a) Integrate any three of the followings: 35

(a) $\int e^{2x} \left(\frac{1 + \sin 2x}{1 + \cos 2x} \right) dx$ (b) $\int \frac{dx}{2 + 3 \cos x - \sin x}$

(c) $\int \frac{2x + 5}{\sqrt{x^2 + x + 3}} dx$ (d) $\int \frac{dx}{(x^2 + 1)\sqrt{2x^2 - 1}}$

6(a) Evaluate any three of the followings: 35

(a) $\int_0^{\frac{\pi}{2}} \ln \sin x dx$ (b) $\int_0^{\frac{\pi}{2}} \frac{dx}{5 + 4 \cos x}$ (c) $\int_0^1 \frac{\sin^{-1} x}{\sqrt{1-x^2}} dx$ (d) $\int_0^{\frac{\pi}{4}} \frac{x dx}{1 + \cos 2x + \sin 2x}$

7(a) Obtain reduction formula for $\int \cos^n x dx$ hence find $\int \cos^5 x dx$. 13

7(b) Prove that $\sqrt{\frac{1}{2}} = \sqrt{\pi}$. 12

7(c) Evaluate $\lim_{n \rightarrow \infty} \left[\frac{n}{n^2 + 1^2} + \frac{n}{n^2 + 2^2} + \frac{n}{n^2 + 3^2} + \dots + \frac{n}{n^2 + n^2} \right]$. 10

8(a) Find the inverse of the matrix: 13

$A = \begin{bmatrix} 3 & 4 & -1 \\ 1 & 0 & 3 \\ 2 & 5 & -4 \end{bmatrix}$ by using elementary row transformations.

8(b) Solve the following system of equations: 12

$2x + y - 3z = 5$

$3x - 2y + 2z = 5$

$5x - 3y - z = 16$

8(c) Define linear dependence and independence of a set of vectors. Test whether the set of 10 vectors $\{(1,0,1), (0,2,2), (3,7,1)\}$ are linearly independent or not. 10

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Textile Engineering

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

TE 1221

(High performance Fibers and Composite)

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 meant by Aramid? What are the common properties of Aramid fiber? 15
1(b) List out five commercial Kevlar fibers with their specific end uses. 10
1(c) Present the schematic diagram of the dry-jet wet spinning system used for the preparation of Kevlar fiber. 10
- 2(a) Describe Gel-spinning process to improve High performance polyethylene fibers. 12
2(b) Discuss physical, electrical and thermal properties of High performance polyethylene fibers. 12
2(c) Define the terms: Gelatin and Crystallization. Describe the drawing process during spinning of High performance polyethylene fibers. 11
- 3(a) Show the process diagram of PAN based and Pitch based carbon fiber manufacturing. 18
3(b) What is carbon nanotube? Describe electric arc method used in synthesis of carbon nanotube. 12
3(c) Write down the five specific end uses of carbon-nanotubes. 05
- 4(a) What is ceramic fiber? Mention the processes of producing ceramic fiber. Describe any one. 17
4(b) What is glass fiber? What is Poiseuille's equation? 10
4(c) Write short notes on (i) Profile and (ii) Hollow fiber. 08

SECTION-B

- 5(a) What are the differences between micro mechanics and macro-mechanics? 13
5(b) Define lamina and laminate. 10
5(c) Define the following terms: 12
(i) Isotropy (ii) Anisotropy and (iii) Homogeneity.
- 6(a) What fiber factors contribute to the mechanical performance of a composite? 10
6(b) Discuss the modifiers used in fiber reinforced composites. 15
6(c) Mention the limitation of matrix materials. 10
- 7(a) What are the advantages and disadvantages of wet-lay-up hand lamination. 16
7(b) Describe injection moulding (IM) process with neat sketch. 12
7(c) Write a short note on Resin Transfer Moulding (RTM). 07
- 8(a) What is nano-composite? State the typical applications of nano-composite. 15
8(b) Why polymer nano-composites are unique? 12
8(c) Describe the different units of vacuum bag molding process. 08

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Textile Engineering

B. Sc. Engineering 1st Year Backlog 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 the following terms: 06
(i) Thermodynamic system (ii) Thermodynamic process and (iii) Thermodynamic equilibrium.
- 1(b) For perfect gas show the relation between specific heats as $\gamma = 1 + \frac{R}{C_v}$, where the 12
symbols have their usual meanings.
- 1(c) State "Zeroth Law" of thermodynamics. Briefly explain the general laws for expansion 08
and compression of a perfect gas with neat sketch.
- 1(d) A container contains 0.5m³ of gas at a pressure of 2.5 bar and 170°C. It is compressed 09
adiabatically to a pressure of 12.5 bar. Determine the work required.
Take $C_p = 1.06$ kJ/kg.K and $C_v = 0.731$ kJ/kg.K.
- 2(a) State the 1st law of thermodynamics. Is PMM1 possible or not? - Explain. 07
- 2(b) What is isentropic process? Deduce the relations of work done for isothermal process. 10
- 2(c) "The internal energy of a closed system will remain unchanged when the system is 08
isolated from the surroundings". Explain this statement with necessary example.
- 2(d) Describe the working principle of a 4-stroke petrol engine with neat sketch. Is petrol 10
engine is IC engine? If yes, then why?
- 3(a) Draw the P-V and T-S diagram of (i) Bryton cycle (ii) Ericsson cycle (iii) Dual cycle and 08
(iv) Diesel cycle
- 3(b) Drive the expression for thermal efficiency of Otto cycle. 10
- 3(c) Differentiate between petrol and diesel engine. 05
- 3 (d) A four stroke engine has 4-cylinders. The diameter of piston is 10cm, stroke length is 12
15 cm. Indicated means effective pressure is 0.67 MPa, the speed of the engine is 2500
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 fuel is 41800 kJ/kg.
Given the relative efficiency is 0.75. Find the (i) mechanical efficiency (ii) brake thermal
efficiency and (iii) Air standard efficiency.
- 4(a) Explain the working principle of reciprocating compressor with neat sketch. How does 10
pump differ from compressor?

- 4(b) Write the working principle of closed cycle gas turbine. Which one of closed cycle or open cycle gas turbine is more effective and why? 10
- 4(c) In a gas turbine two pressure levels are 1.5 bar and 6.5 bar respectively. Compressor sucks air at ambient temperature 27°C and the compressor outlet is heated up in the combustion chamber by 200°C. Calculate the (i) turbine work and (ii) thermal efficiency. 15
[Use $C_p = 1.1 \text{ kJ/kg.K}$]

SECTION-B

- 5(a) Classify steam boilers. Write down the differences between water tube and fire tube boilers. 08
- 5(b) Write the functions of following terms: 06
(i) Blow off cock (ii) Safety valve and (iii) Steam stop valve.
- 5(c) Describe the working principle of a reciprocating pump. 10
- 5(d) A Lancashire boiler generates 2400 kg of dry steam per hour at a pressure of 11.5 bar. The grate area is 3 m^2 and 90 kg of coal is burnt per m^2 of grate area per hour. The calorific value of the coal is 33180 kJ/kg and the temperature of feed water is 17.5°C. Calculate the 11
(i) Actual evaporation per kg of coal
(ii) Equivalent evaporation from and at 100°C, and
(iii) Efficiency of the boiler
- 6(a) Explain the working principle of a vapor compression refrigeration system with neat sketch. 15
- 6(b) Write down the properties of a good refrigerant. 08
- 6(c) Explain the application of refrigeration and air conditioning. 05
- 6(d) Define human comfort. What are factors which influence human comfort? 07
- 7(a) What is air conditioning? What are its applications? 06
- 7(b) Describe different modes of heat transfer with their governing equation. 07
- 7(c) Derive the expression of one dimensional heat conduction and hence show that conduction heat transfer is mostly dependent on temperature gradient. 10
- 7(d) Explain the working principle of a summer air conditioning system. 12
- 8(a) What is pool boiling? Draw a pool boiling curve showing its principle regimes. 10
- 8(b) What is condensation? How does film wise condensation differ from drop wise condensation? 07
- 8(c) Explain the concept of black body radiation and also define grey body. 06
- 8(d) Define black body. A hole of area $dA = 2 \text{ cm}^2$ is opened on the surface of a large spherical cavity whose inside is maintained at $T = 800 \text{ K}$. Calculate the radiation energy streaming through the hole in all directions into space. 12

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KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Textile Engineering

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

Ch 1221
(Chemistry-II)

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 stereoisomerism? Distinguish between two types of stereoisomerism. 10
- 1(b) Illustrate sequence rules for assigning R and S configuration to an optically active compound. 12
- 1(c) How will you distinguish between Enantiomers and Diastereomers? 07
- 1(d) How can D and L tartaric acids be obtained in optically active forms from a racemic mixture? 06
- 2(a) Describe the mechanism of SN¹ and SN² reactions in the case of alkyl halides. What is the order of reactivity of primary, secondary and tertiary halides in relation to SN¹ and SN² reaction? 12
- 2(b) Alcohols behave both as acids and bases-Explain. 08
- 2(c) How would you distinguish between a ketone and an aldehyde? 07
- 2(d) Lower alcohols are soluble in water-Explain. 08
- 3(a) Explain why methylamine is a stronger base than ammonia. 09
- 3(b) Arrange the following compounds in order of increasing base strength. Give a reason for the order you select. 09
(i) CH₃NH₂ (ii) NH₃ (iii) (CH₃)₃N and (iv) (CH₃)₂NH
- 3(c) Explain why dimethylamine has a higher boiling point than trimethylamine even though the latter has an approximately higher molecular weight? 10
- 3(d) What is sulphonylation of amines? 07
- 4(a) What are amino acids? What is their importance? 08
- 4(b) Why α-amino acids (except glycine) are optically active? 08
- 4(c) How can you identify C-terminal and N-terminal residue of proteins? 09
- 4(d) What is meant by denaturation of proteins? What happens when amino acids are reacted with ninhydrin? 10

SECTION-B

- 5(a) Define aromaticity and explain Huckel's rule. Will cyclo-octatetraene show aromatic character? 10
- 5(b) Explain the mechanism of electrophilic substitution in benzene. 10

5(c)	Explain with examples Friedel-crafts alkylation and acylation reactions.	10
5(d)	Write a short note on 'resonance'.	05
6(a)	What are carbohydrates? How are they classified?	10
6(b)	What happens when glucose is treated with:	09
	(i) $\text{Br}_2 + \text{H}_2\text{O}$	
	(ii) H_2, Ni	
	(iii) $\text{C}_6\text{H}_5\text{NHNH}_2$	
6(c)	How will you prove that glucose has a ring structure?	08
6(d)	Write down the structure of maltose. What product is formed when it is hydrolysed?	08
7(a)	What is a dye? How are dyes classified on the basis of their constitution?	10
7(b)	Write short notes on:	15
	(i) Mordant dyes	
	(ii) Vat dyes	
	(iii) Pigments	
7(c)	What are dye intermediates? Briefly discuss the application of dye intermediates.	10
8(a)	What is anomeric effect? Differentiate between anomers and epimers.	10
8(b)	Write the structure of amylose by end group analysis. Briefly discuss each step.	10
8(c)	What is mutarotation? Explain with the help of an example.	10
8(d)	Point out the characteristic differences between cellulose and starch.	05

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