Khulna University of Engineering & Technology

Department of Building Engineering and Construction Management

B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2016

CE 1201

(Engineering Mechanics)

Full Marks: 210 Time: 3 hrs

N.B. i) Answer any three questions from each section in separate script.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable value for any missing data.
iv) All figures are not drawn in scale.

Section – A

1. (a) Define – (i) Transmissibility of force system (ii) Two force member (iii) Free - body diagram (iv) Equilibrium (v) Zero force member (10)

(b) Draw the free body diagram of members of the following structures. (13)

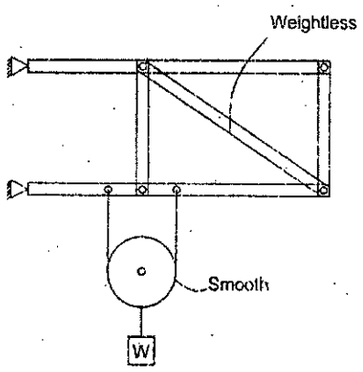


Figure - (i)

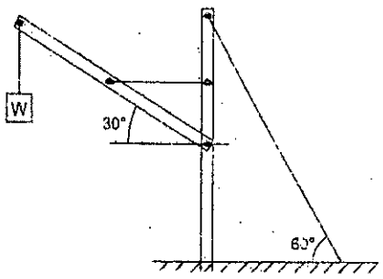
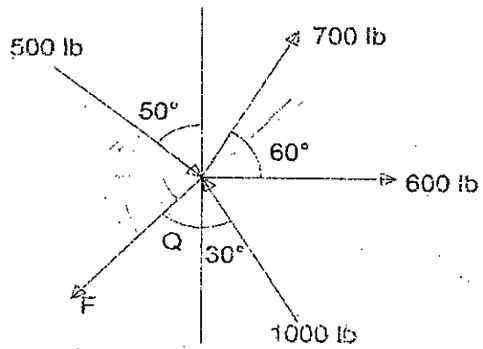
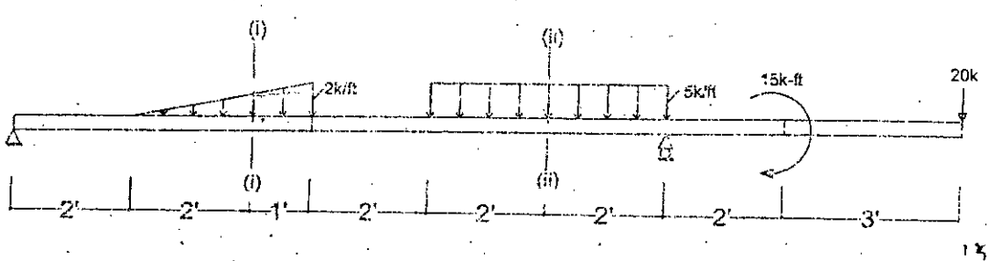


Figure - (ii)

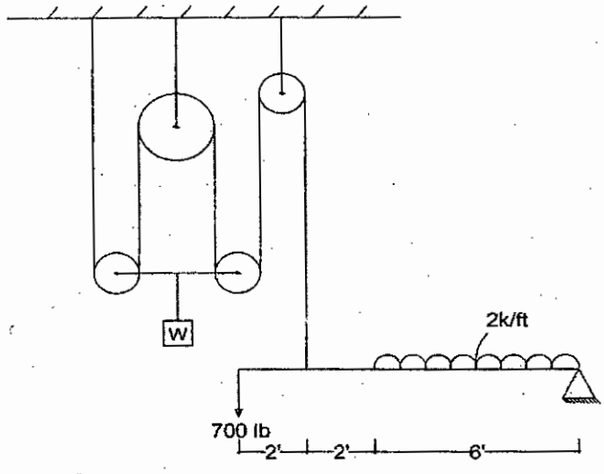
(c) Find the value of F and Q of the following force system shown in figure below. Also find the resultant of that force system. (12)



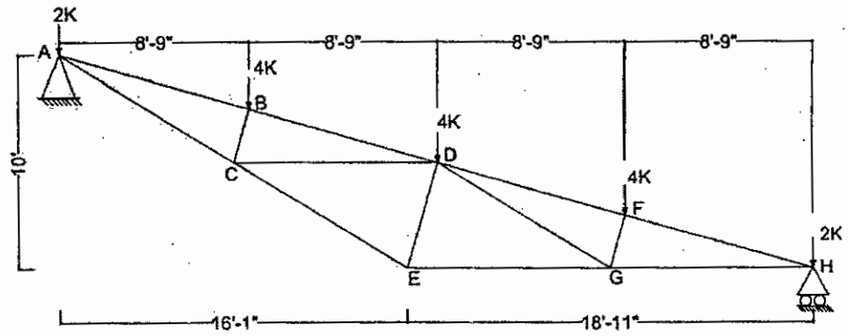
2. (a) Define shear and bending moment. A simply supported beam is loaded as shown in figure below. Find (i) The reaction of A and B and (ii) Bending moment and shear at section (i)-(i) and (ii)-(ii). (20)



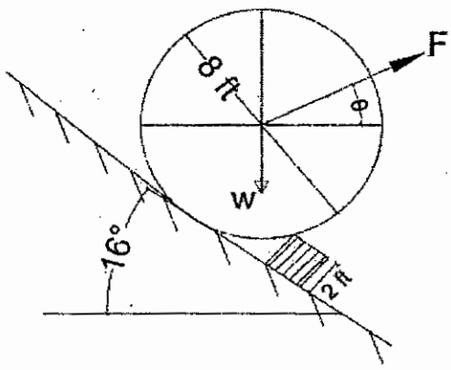
(b) In the following figure, what will be the value of 'W' if equilibrium exists? Assume the pulleys are frictionless and weightless. (15)



3. (a) Determine the force of the members located to the right of DE for the inverted Howe roof truss. (22)

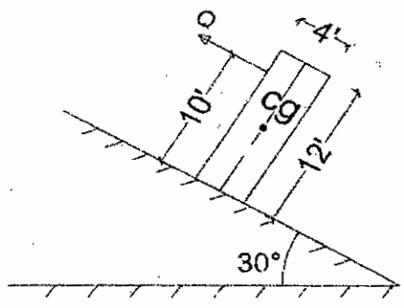


(b) The wheel shown in figure given below is on the point of rolling over the block. If W=100 lb, What is the magnitude and sense of the least force F that will produce this condition. (13)

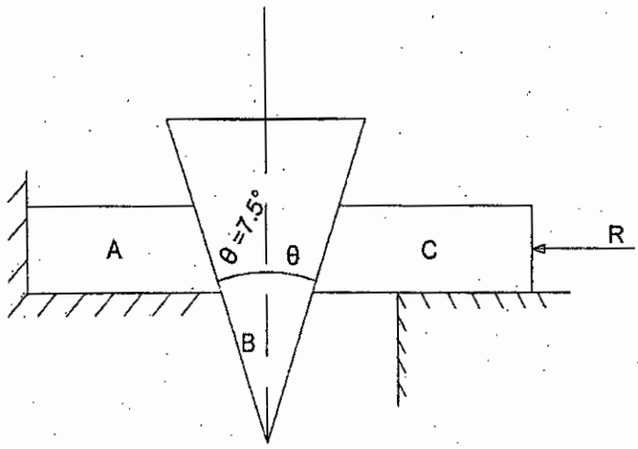


4. (a) Distinguish between angle of friction and angle of repose. (05)

(b) State the laws of friction. A relative tall and slender body be as shown in figure below with a gradually increasing force Q applied to it, if W = 105 lb, f = 0.3 and inclination of the plane is 30^0, will the body slider or tip over? (15)



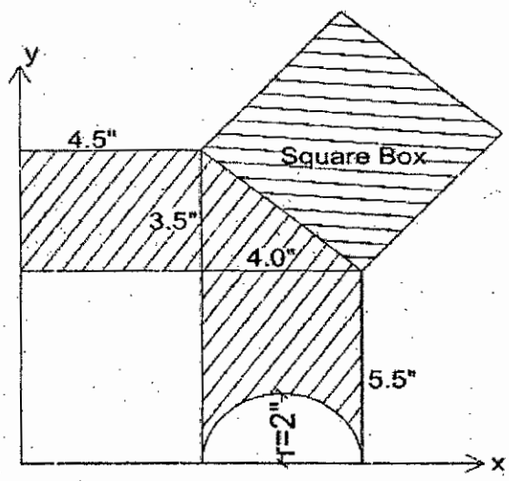
(c) Find the force Q on the top of the wedge. Given that W_A = 200 lb, W_B = 500 lb, W_C=5000 lb and Force R = 8000 lb. Neglect all friction so that the reactions are normal to the surfaces. (15)



Section – B

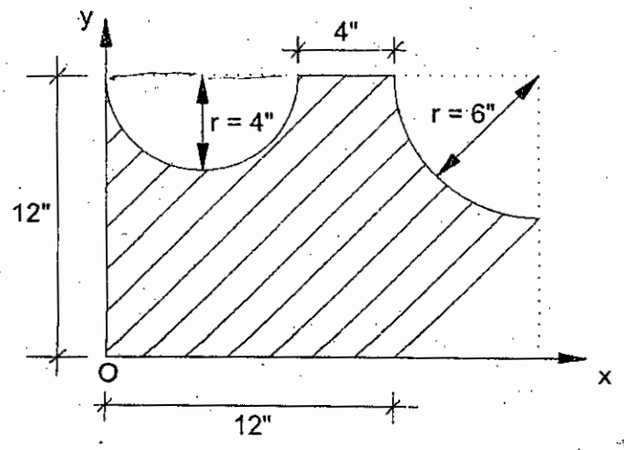
5. (a) Define Centroid. Briefly describe the real life applications of centroid. Find the centroid of a triangle, whose altitude h and has a base b. (15)

(b) Compute $\bar{x}$ and $\bar{y}$ of the shaded area shown in figure below. (20)



6. (a) Define second moment of inertia and polar moment of inertia. Prove that $k^2 = \bar{k}^2 + d^2$, where the symbols bear their usual meanings. (13)

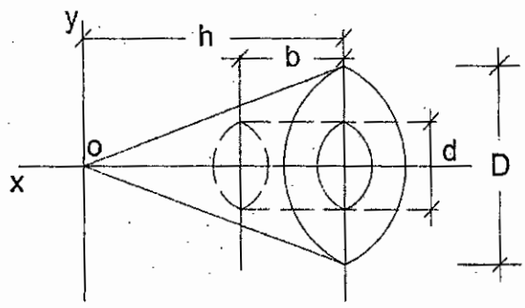
(b) Why basic concept of moment of inertia is significant? For the shaded area of the following figure: (i) Compute I_x and I_y. (22)



7. (a) What do you mean by work and power? Prove that $W_{net} = \Delta KE$, where the symbols bear their usual meanings. (10)

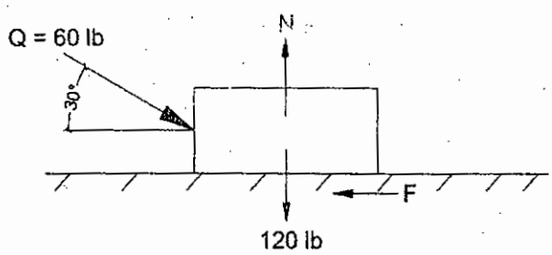
(b) What is work done against gravity in lifting the material to its place during the building of a circular masonry chimney which is 350 ft high, 7m outside diameter and 5 m inside diameter? The masonry weighs 115 lb/ft^3. (10)

(c) A right circular cone of homogeneous material (as shown below) has a diameter D = 20 in., altitude, h = 30 in. A cylindrical hole, whose geometric axis is coincident with that of the cone, is bored in the base. This hole has a diameter, d = 8 in. and a depth, b = 6 in. Locate the center of gravity of the cone with the hole. (15)

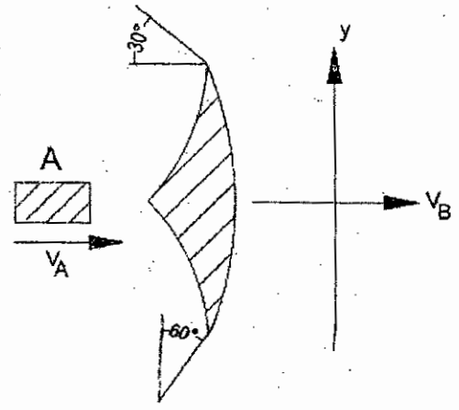


8. (a) State the principle of linear impulse and momentum. Prove that, $R\Delta t = \Delta mv$, where the symbols bear their usual meanings. (10)

(b) A 120 lb body is on a horizontal plane, where the co-efficient of kinetic friction, f = 0.15. A force of Q = 60 lb in figure. (i) What is the impulse of Q in the horizontal direction during 3 sec? (ii) What is the net impulse on the body during the same time? (10)



(c) A jet of water A, whose velocity V_A = 55 fps, strikes a blade B, which is moving at V_B = 20 fps in the same direction as A, shown in figure. 7 lb/s of water strike the blade, half-passing without friction along the upper part and half-passing across the lower. What force in the y – direction is needed to prevent the movement of the blade in that direction? What is the horizontal thrust on the blade? (15)



Khulna University of Engineering & Technology
Department of Building Engineering & Construction Management
B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2016
CE 1213
(Building & Construction Materials)

Full Marks: 210 Time: 3 hrs

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

Section – A

1. (a) Define engineering materials. Write down the importance of engineering materials from building construction point of view. (06)

   (b) What are the harmful constituents of brick clay? What are their harmful effects? (09)

   (c) Write down the advantages and disadvantages of Bull's trench kiln and Hoffman's kiln for brick burning with their figures. (11)

   (d) Write down the classification of bricks according to P.W.D. in Bangladesh with short explanation. How can you identify good bricks in field? (09)

2. (a) Write down the characteristics of good bricks. Shortly describe different steps of preparation of clay for brick manufacturing. (10)

   (b) Define tiles. Describe different types of tiles according to their use with figures. (09)

   (c) Define the flowing terms. (i) Angularity number (ii) Apparent specific gravity (iii) Air dry aggregate (iv) Flaky and elongated particle. (08)

   (d) Write short note on bulking of aggregates. Write down the properties of good sand. (08)

3. (a) Define well graded, gap graded, and poorly graded aggregate with typical gradation curve. Describe the classification of sand based on grain size distribution. (07)

   (b) What is mortar? Write down the functions of different ingredients used in mortars. (09)

   (c) Write down the specifications of good plaster. Write about the preparation of surface for plastering. (08)

   (d) Define fineness modulus. Sieve analysis data of two different varieties of sand, one from Sylhet and other from Kushtia are given in Table-1. Weight of each sample is 500gm. Determine the combined fineness modulus of a mixture prepared by using 5.0 kg Sylhet sand and 5.0 kg Kushtia sand. (11)

Table-1: Sieve analysis data.

Sieve size	Sylhet sand	Kushtia sand
	Weight Retained (gm)	Weight Retained (gm)
No. 4	21	03
No. 8	58	11
No. 16	105	35
No. 30	111	52
No. 50	115	262
No. 100	90	137

4. (a) Define pointing. Describe different types of pointing with neat sketches. (07)

(b) Write short notes on (i) Painting (ii) White washing (iii) Colour washing (iv) Distempering. (12)

(c) Describe different types of natural defects occur in timbers with figures. (08)

(d) Write short note on seasoning of timber. Shortly describe the different methods of sawing timber with figures. (08)

Section – B

5. (a) Define concrete. Discuss about the quantity of mixing water in concrete. (08)

(b) Differentiate between the workability and consistency of concrete. Show the suitable slump value for different construction purpose. Draw the schematic diagram of true shear and collapse slump of concrete. (15)

(c) Write short notes on (i) Segregation of concrete (ii) Bleeding of concrete (iii) Creep of concrete (iv) Workability of concrete. (12)

6. (a) What do you mean hydraulicity and soundness of cement? Discuss briefly the consistency test of cement. (10)

(b) How are the compressive strength and tensile strength of concrete related? Differentiate between creep and shrinkage of concrete. (07)

(c) Draw a stress-strain curve for concrete and from this curve how could you determine the young's modulus, secant modulus, chord modulus and modulus of elasticity? (10)

(d) Explain the mechanism of corrosion of reinforcement in concrete. (08)

7. (a) Write short notes on (i) Pre-stressed concrete (ii) Micro-concrete (iii) Ply wood (iv) Light weight concrete. (12)

(b) Concrete is required for a heavy bridge pier that will be exposed to fresh water in a severe climate. Required compressive strength will be 250 kg/cm^2 at 28 days with a slump of 100mm. The coarse aggregate has a nominal maximum size of 37.5mm and dry rodded mass of 1600 kg/m^3. The specific gravity of fine and coarse aggregate are 2.64 and 2.68 respectively. FM of fine aggregate is 2.80. Ordinary Portland Cement of specific gravity 3.10 is used. Given (23)

(i) W/C = 0.52 for 250 kg/cm^2 compressive strength

(ii) Approximate mixing water = 165 kg/m^3 for the known slump 100mm and aggregate size 37.5mm.

(iii) Volume of dry rodded CA per unit volume of concrete = 0.71 m^3

(iv) Restricted W/C = 0.50 for the structure.

(v) Recommended air content = 5.5%

(vi) Moisture content of CA and FA are 1% and 5% respectively.

8. (a) Explain mechanism of flash setting of cement and how can it be minimized? (07)

(b) Draw the schematic diagram of typical fracture patterns of cylinder in compressive strength test of concrete. (12)

(c) Describe the different important properties of cement (10)

(d) Define admixtures. Classify admixtures according to ASTM (06)

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2016

Math 1223

(Mathematics - II)

Full Marks: 210 Time: 3 hrs

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

Section – A

1. (a) Define direction cosine and direction ratio. If $l_1, m_1, n_1; l_2, m_2, n_2; l_3, m_3, n_3$ are direction cosines of three mutually perpendicular lines. The line whose direction cosines are proportion to $l_1 + l_2 + l_3, m_1 + m_2 + m_3; n_1 + n_2 + n_3$. Prove that this lines makes equal angle with them. (17)

   (b) Find the length and the equation of the S.D between the lines whose equations are $x + y = 0, z = 4$ and $\frac{x-1}{4} = \frac{y-2}{3} = \frac{z-36}{-6}$ (18)

2. (a) A variable plane is at a constant distance P from the origin and meets the axes in A, B, C. Through A, B, C planes are drawn parallel to the co-ordinate planes. Show that the locus of their point of intersection is $x^{-2} + y^{-2} + z^{-2} = p^{-2}$. (17)

   (b) If $l_1, m_1, n_1; l_2, m_2, n_2$ are the direction cosines of two lines inclined at an angle θ to each other. Show that the line with direction cosines (18)

$$\frac{l_1 + l_2}{2\cos\theta/2}, \frac{m_1 + m_2}{2\cos\theta/2}, \frac{n_1 + n_2}{2\cos\theta/2}$$

3. (a) Find the equation of the lines $x + y + z + 1 = 0 = 4x + y - 2z + 2$ in symmetric form. (10)

   (b) Show that the length of the shortest distance (SD) between the lines $\frac{x+3}{2} = \frac{y-6}{3} = \frac{z-3}{-2}$ and $\frac{x}{2} = \frac{y-6}{2} = \frac{z}{-1}$ is 3 and that the line of the SD cuts z – axis. (15)

   (c) A plane passes through a fixed point p (a, b, c) and cuts the axes in A, B, C. Show that the locus of the center of the sphere OABC is $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$. (10)

4. (a) Define right circular cone. Find the equation of the right circular cone whose vertex is (α, β, γ) semivertical angle α and the axis has direction cosines l, m, n. (15)

   (b) A line with direction cosines proportional to (2, 7, -5) is drawn to intersect the lines $\frac{x-5}{3} = \frac{y-7}{-1} = \frac{z+2}{1}$ and $\frac{x+3}{-3} = \frac{y-3}{2} = \frac{z-6}{4}$. Find the co-ordinates of the point of intersection and the length intercepted on it. (20)

Section – B

5. (a) Explain general solution and particular solution of a differential equation with examples. (03)

(b) From a differential equation for which $y = c_1x + \frac{c_2}{x}$ is the general solution. (07)

(c) Solve $y^2dx + (x^2 - xy + y^2)dy = 0$ (09)

(d) Applying the method of variation of parameters solve. (16)

$$\frac{d^2y}{dx} - 2\frac{dy}{dx} + y = \frac{e^{2x}}{(1 + e^x)^2}$$

6. Solve any three: (35)

(a) $\frac{dy}{dx} = \frac{y(x-2y)}{x^2-3xy}$

(b) $\log\left(\frac{dy}{dx}\right) = ax + by$

(c) $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$

(d) $(3x + y - 3)dy = (2x + y - 2)dx$

7. (a) Solve $xdx + ydy = \frac{a^2(xdy - ydx)}{x^2+y^2}$ (11)

(b) Solve any two of the followings: (24)

i) $(D^2 + 2)y = x^2e^{3x} + e^x \cos 2x$

ii) $(D^3 - D)y = 2x + 1 + 4\cos x + 2e^x$

iii) $(D^4 + 2D^2 + 1)y = x^2 \cos^2 x$

where $D = \frac{d}{dx}$, $D^2 = \frac{d^2}{dx}$ and so on.

8. (a) If, when the temperature of the air is 290°K, a certain substance cools from 370°K to 330°K in 10 minutes. Find the temperature of the substance after 40 minutes. (08)

(b) Solve the initial value problem $\frac{d^2y}{dx} + 4\frac{dy}{dx} + 8y = 0$ given that y (0) = 0 and $\frac{dy}{dx}(0) = 8$. (12)

(c) Solve the boundary value problem $\frac{\partial^2 y}{\partial t^2} = C^2 \frac{\partial^2 y}{\partial x^2}$, subjected to the boundary conditions y (0, t) = y (1, t) = 0 and the initial conditions (15)

$y(x,0) = \frac{y_0}{4}(3\sin \pi x - \sin 3\pi x)$ and

$\frac{\partial y}{\partial t}(x,0) = 0$, where y_0 is constant.

Khulna University of Engineering & Technology
Department of Building Engineering & Construction Management
B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2016
Ph 1223
(Physics - II)

Full Marks: 210 Time: 3 hrs

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

Section – A

1. (a) What do you mean by phase velocity and group velocity of de Broglie waves? Establish a relationship between them. (10)
   (b) What sense wave theory is inadequate to explain photo-electric effect? Discuss in details of Einstein's explanation regarding the photo-electric effect. (15)
   (c) X-rays of wavelength 18 pm (photon energy = 49 KeV) are scattered from a carbon target, and the scattered rays are detected at 89^0 to the incident beam (i) What is the Compton shift of the scattered rays? (ii) What percentage of the initial x-ray photon energy is transferred to an electron in such scattering? (10)

2. (a) What is correspondence principle? Discuss Bohr correspondence principle? (12)
   (b) What is spectral series? Calculate the limiting values of wavelength in different spectral series of H_2 atom. (15)
   (c) Calculate the radii of first, second, third and 5^{th} electron orbits in a hydrogen atom. (08)

3. (a) Define Curie temperature and Neel temperature. Obtain a relation between magnetic permeability and magnetic susceptibility. (10)
   (b) Discuss briefly the distinguishing features of paramagnetic, ferromagnetic and ferrimagnetic substances. (15)
   (c) An electron has a de Broglie wavelength of 1.98 pm. Find its kinetic energy and the phase and group velocities of its de Broglie waves. (10)

4. (a) In practice how many crystal systems are possible? Give the name starting the relationship between crystallography axes and the angle between them. (10)
   (b) What do you mean by unit cell and Bravais lattice? Show that, in a crystal of cubic structure, the distance between the planes with Miller indices (hkl) is equal to $\frac{a}{\sqrt{h^2+k^2+l^2}}$; where "a" is the lattice parameter. (15)
   (c) A diffraction pattern is obtained for lead with radiations of wavelength 1.54 A^0. The (220) reflection is observed at Bragg's angle, 32^0. What are the lattice parameter of lead and radius of the atom? (10)

Section – B

5. (a) What is principle of reversibility? Discuss interference pattern due to transmitted light in thin film. (12)

   (b) What is Newton's ring? How Newton's ring formed by reflected light? Show that the fringe width decreases with the order of the fringe. (13)

   (c) Light of wavelength 5890 A^0 is incident on a slit of width 0.4 cm. The screen is placed 2m from the slit. Find (i) the position of the first dark fringe and (ii) the width of the first central bright fringe. (10)

6. (a) What is Fraunhofer diffraction? Starting from the resultant displacement equation calculate the intensity of 1^{st}, 2^{nd}, 3^{rd}, 4^{th} and 5^{th} secondary maxima. (15)

   (b) State and explain Brewster's law. Show that at the polarizing angle of incidence the reflected and refracted ray are mutually perpendicular to each other. (10)

   (c) Newton's rings are formed by light of λ = 5890 A^0 between a double convex lens and a glass plate with a liquid between them. The diameters of 5^{th} and 15^{th} ring in the reflected system are 2.78 mm and 4.51 mm respectively. If the radius of curvature of the lens is 80 cm, calculate the refractive index of the liquid. (10)

7. (a) What is color matching? Discuss additive theory of color matching. (12)

   (b) Discuss the axioms of color matching. (10)

   (c) What is radiant intensity? Discuss the formulation for the quantitative foundation for calorimetry. (13)

8. (a) State and explain radioactive decay law. Draw the binding energy per nucleon curve. (10)

   (b) Explain nucleon fission and nuclear fusion reactions with examples. What is the source of energy release in nuclear fission? Calculate the energy released in fission of ^{235}U nucleus. (15)

   (c) The ratio of ^{235}U to ^{238}U in natural uranium deposits today is 0.0087. What was the ratio $1.7X10^8$ y ago? The half-lives of the two isotopes are $8x10^7$ y and $46.04x10^7$ y, respectively. (10)

Khulna University of Engineering & Technology

Department of Building Engineering and Construction Management

B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2016

Hum 1223

(Sociology)

Full Marks: 210 Time: 3 hrs

N.B. i) Answer any three questions from each section in separate script.

ii) Figures in the right margin indicate full marks.

Section – A

1. (a) Define Sociology. Explain the importance of studying 'Sociology' for the students of Building Engineering and Construction Management. (15)

   (b) What is community? What are the differences between community and society? (10)

   (c) What is institution? Where does it differ from association? (10)

2. (a) What is culture and civilization? What are the functions of culture in society? (15)

   (b) What is cultural change? Discuss the causes of cultural change. (10)

   (c) Explain the basic elements of culture. (10)

3. (a) Define family. Discuss the main functions of family. (10)

   (b) What is nuclear and joint family? What are the reasons for breaking joint family? Discuss. (15)

   (c) What is socialization? What are the stages of socialization? (10)

4. (a) What is marriage? How many types of marriage in Bangladesh? Discuss. (10)

   (b) Explain "Cultural lag" in the context of Bangladesh. (15)

   (c) Describe in brief the role of culture in socialization. (10)

Section – B

5. (a) What is Social Structure? What are the basic elements of Social Structure? (15)

   (b) What do you mean by social change? Explain the functions in a social change. (10)

   (c) Difference between 'Ascribed' and 'Achieved' status. (10)

6. (a) What is Industrialization? (05)

   (b) What is urban growth and what are the causes of urban growth? (10)

   (c) What is Urbanism? Explain "Urbanism" as a way of life. (20)

7. (a) What is "Rural-Urban Convergence"? (10)

   (b) What is suburban living and what are the problems? (10)

   (c) What is urban process? Explain the spatial distribution of a city. (15)

8. (a) What is social control? (05)

   (b) Explain Travis Hirschi's explanation of social bonding. (15)

   (c) Differentiate between 'Deviant Behavior' and 'Crime'? Explain different types of crime. (15)
