

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
 B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2018
CE 1201
 (Engineering Mechanics)

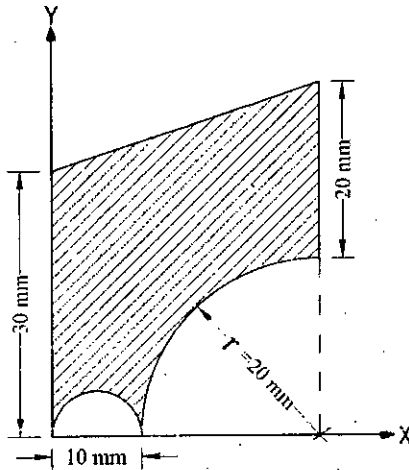
Full Marks: 210

Time: 3.00 hrs

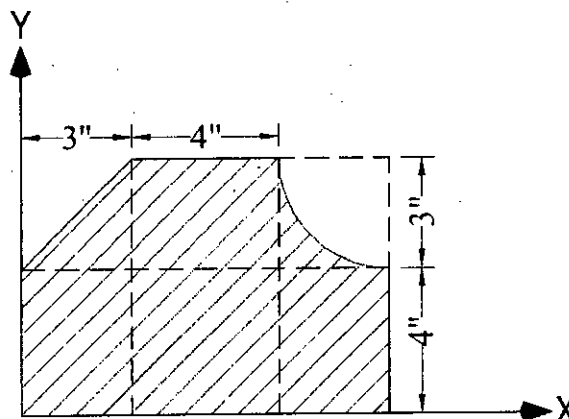
- N.B.** i) Answer any three questions from each section in separate script.
 ii) Figures in the right margin indicate full marks.
 iii) Assume reasonable value for any missing data.
 iv) All figures are not drawn in scale.

Section – A

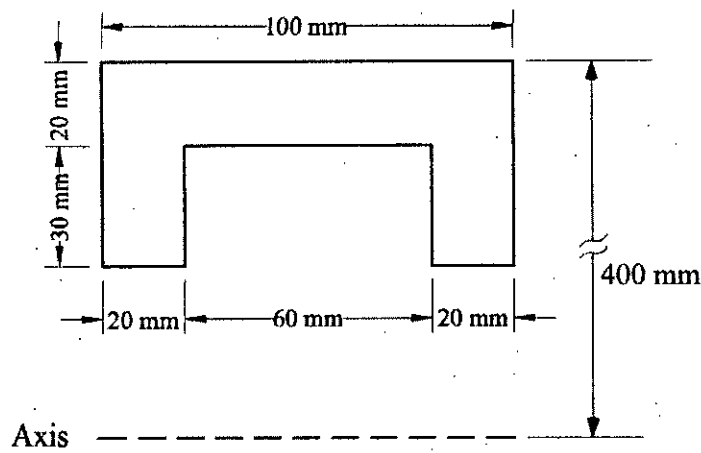
1. (a) Define centroid. Describe the axis symmetry. Find the location of centroid of a triangle with respect to horizontal axis having a base, b and height, h . (10)
- (b) Determine the centroid about X axis and Y axis of the shaded area as shown in figure below. (25)



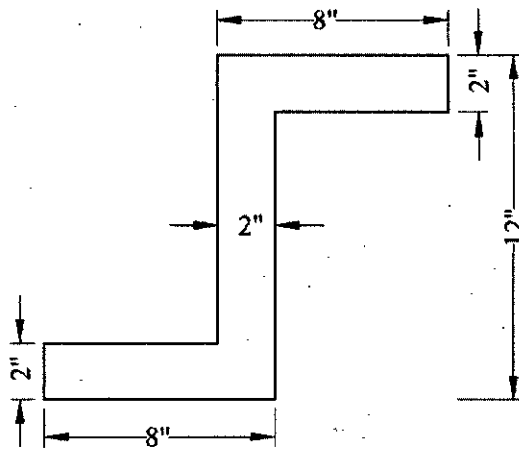
2. (a) Write short notes on rectangular moment of inertia, polar moment of inertia and product of inertia. Show that $J = I_x + I_y$, where the symbols bear their usual meanings. (10)
- (b) Prescribed the real life application of first and second moment of inertia. Calculate the second moment of area of the shaded area about parallel axis and centroidal axis parallel to X and Y axis. (25)



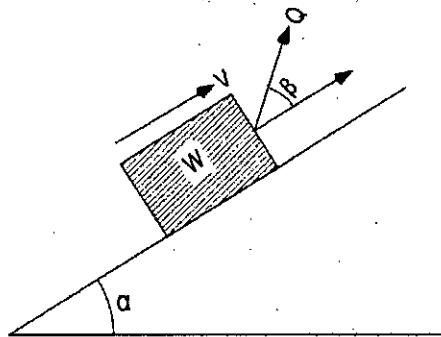
3. (a) State Pappus - Guldinus theorem of area and volume. Apply the theorem of Pappus-Guldinus to calculate the volume or revolution of rim section and the inner cutout section. Multiply by density and acceleration to get the mass and density. (Given $\rho = 7.85 \times 10^3 \text{ kg/m}^3$). The outside diameter of a pulley is 0.8 m and the cross-section of its rim is as shown in figure. (18)



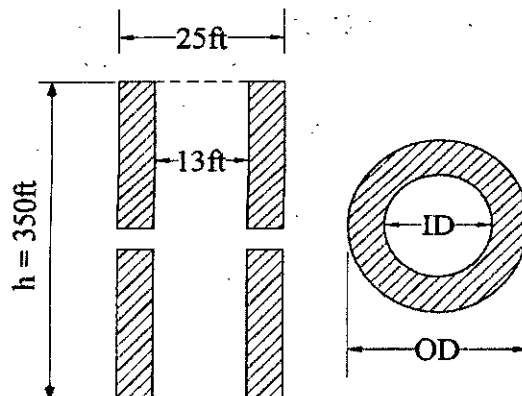
- (b) Enumerate the product of inertia of 12 x 8 x 2 inch, Z- section about the centroidal axis. (17)



4. (a) Explain the terms work and kinetic energy. In figure, $W = 109 \text{ lb}$, $\alpha = 39^\circ$, $Q = 129 \text{ lb}$, $\beta = 22^\circ$, $f = 1/4$, and the body is displaced 12 ft up the inclined surface. Find the resultant force on W and the net workdone. (14)

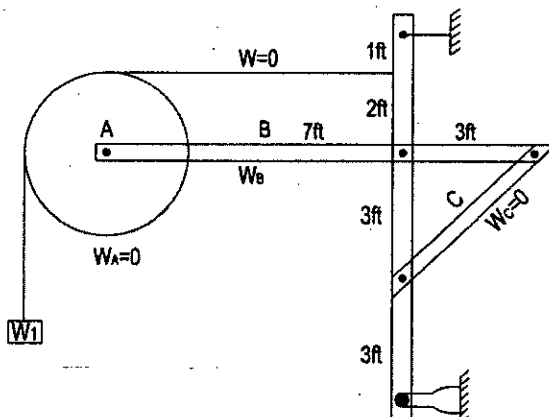


- (b) State the principle of linear impulse and momentum. Prove that, $R\Delta t = \Delta mv$, where the symbols bear their usual meanings. (11)
- (c) What is the workdone against gravity in lifting the material to its place during the building of a masonry chimney which is 350 ft height, 25 ft OD, and 13 ft ID? The masonry weights 100 lb per cubic feet. (10)

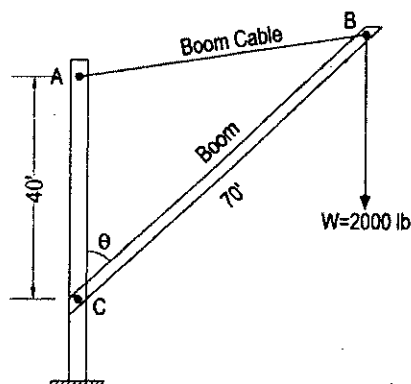


Section – B

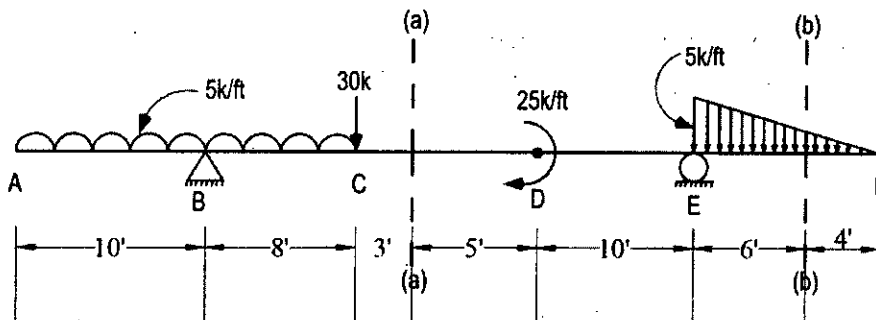
5. (a) Define- (i) Transmissibility of force (ii) Two force member (iii) Equilibrium (iv) Free body diagram. Draw the free body diagram of members of the following structure. (18)



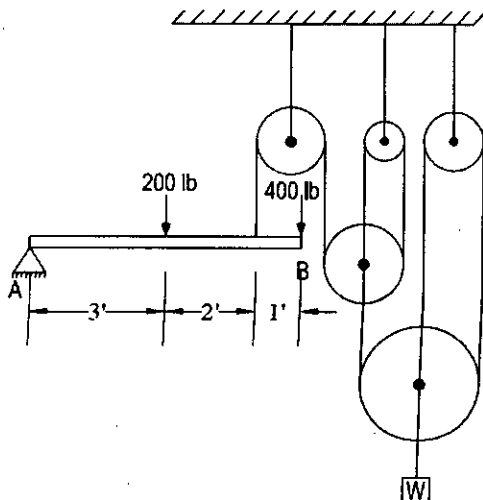
- (b) A derrick shown diagrammatically in the following figure supports a load of $W = 2$ (17)
kips. Find the tension in the boom cable and the compression in the boom when θ is
(a) 30° and (b) 90° . Which position produces the largest load on the boom?



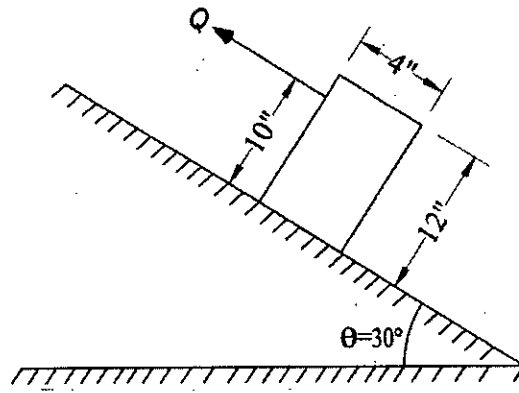
6. (a) Define shear force and bending moment. A beam is loaded as shown in figure below. (20)
Find (i) the reaction of A and E, (ii) Bending moment and shear at section (a)-(a) and
(b)-(b).



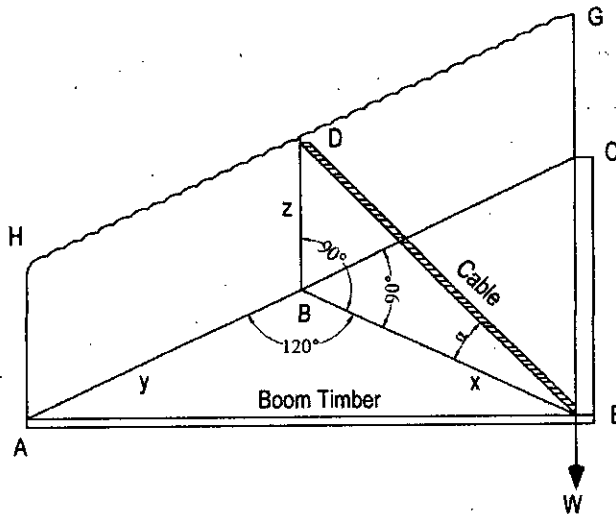
- (b) In the following figure what will be the value of 'W' if equilibrium exists? Assume the (15)
pulleys are frictionless.



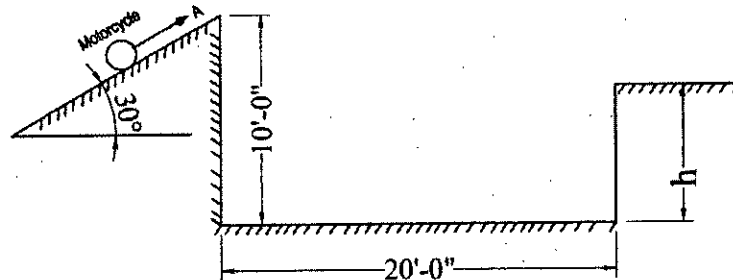
7. (a) A relatively tall and slender body is shown in figure below with a gradual force Q (15)
 applied to it. If $W = 100$ lb and $f = 0.4$ and the inclination of the plane is 30° , will
 the body slide or tipover?



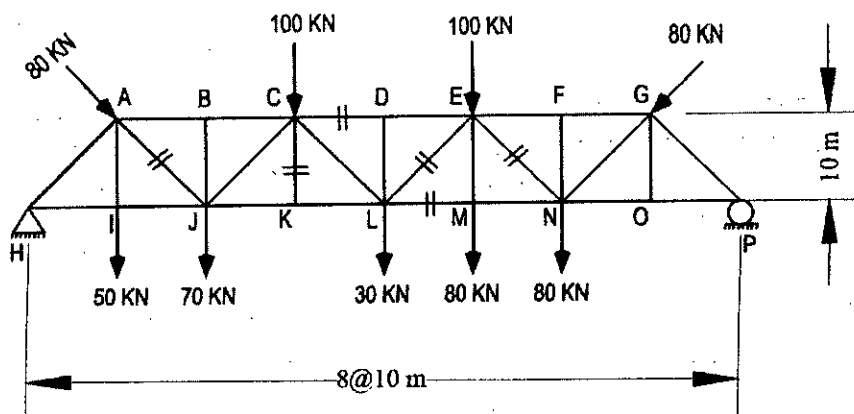
- (b) Define wedge and plane motion. The following figure represents a boom that support (20)
 a load of $W = 2$ kip, if $AB = BC = BD = 8$ ft. and $BE = 8$ ft, find the tension in the cable
 and the force in each member AE and CE .



8. (a) A motor cycle strut rider passes point A, in the following figure at a speed of 70 mph. (15)
 What is the maximum value of 'h', if the motor cycle (consider as particle) is to jump
 the 20 ft ditch? Neglect the air resistance and somersaults.



- (b) Determine the nature and magnitude of the forces in the members AJ , CK , CD , EL , (20)
 LM and EN as shown in figure.



Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2018
CE 1213
(Building and 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) Differentiate between limestone and lime. What are the uses of lime in construction industry? (07)
- (b) State the mechanism of slaking of lime. Briefly describe the adhesive and soundness test of lime. (10)
- (c) Write down the applications and benefits of wood plastic composites? State the significance of wood plastic composites in construction industry. (09)
- (d) Discuss how the creep and shrinkage lead to cracking of the reinforced concrete structures? Express the influencing factors that affecting the amount of creep. (09)

2. (a) Describe the ordinary Portland cement manufacturing including three distinct operations and compare wet and dry process of manufacturing with flow diagram. (11)
- (b) Compare and contrast initial setting time and final setting time of cement. (05)
- (c) List down the name of laboratory tests of cement and discuss standard consistency and strength test of cement. (10)
- (d) Write down the procedure of mixing Ferrocement. State the advantages of FRP in structural engineering field. (09)

3. (a) Demonstrate the influence of curing temperature on strength of concrete. Illustrate and explain the relationship between compressive strength and tensile strength of concrete. (09)
- (b) Why compressive strength of concrete cube is greater than that of cylinder strength? Display the reasons based on its failure nature. (06)
- (c) Shortly describe the following terms (i) Durability of concrete (ii) Corrosion of rebar in concrete (iii) Mineral admixtures in concrete (iv) J-ring test of SCC concrete. (12)
- (d) Three 100 x 200 mm cylinder concrete specimens prepared from the same batch were crushed under uniaxial compressive loads of 265 kN, 270 kN and 262 kN. Calculate the average compressive strength of concrete and also predict the minimum flexural failure load with the size of 100 x 100 x 500 mm prism which made from the same batch of cylinder specimens. (08)

4. (a) How the workability can be improved for normal weight aggregate concrete? What are the methods available to measure the workability of concrete experimentally? (06)
- (b) Write is seasoning of timber? State the applications of natural rubber. (05)
- (c) Design a concrete mix for the construction of reinforced concrete foundation work of five-storied residential building using DOE method for the following data: (24)
 - Required characteristic compressive strength = 37 MPa at 28 days
 - Type of cement used = Ordinary Portland Cement (Type I)
 - Desired slump = 70 mm
 - Maximum size of aggregate = 20 mm
 - Type of aggregate = Uncrushed
 - Specific gravity of cement = 3.15
 - Specific gravity of coarse aggregate = 2.65

- Fine aggregate conforms to grade Zone III with percent passing 600 micron sieve being 80 %
 - Exposure condition = Moderate
 - Standard deviation = 6.0 and Defective Rate = 5 %
- Assume reasonable value for any missing data.
[Necessary graphs and tables will be supplied]

Section – B

5. (a) Which burning process is mostly used for manufacturing of bricks in Bangladesh? (09)
Describe the working principle of that kiln.
- (b) Define tiles. Write down the different types of tiles according to their uses. (06)
- (c) What are the constituents of oil based paint. Point out the characteristics of a good paint. (08)
- (d) Write short notes on (i) Pigments (ii) Vehicle (iii) Thinner (iv) Frog Mark (12)
6. (a) State the characteristics of a good brick. What are the tests that are carried out in the field to determine the quality of good bricks? (12)
- (b) Define well graded, gap graded, and poorly graded aggregate with typical gradation curve. Provide the classification of sand passed on the following (a) Source (b) Size (12)
- (c) Shortly describe the different steps of preparation of clay for brick manufacturing. (11)
7. (a) Express the properties of good sand. Why sea sand is not recommended for making cement concrete? (05)
- (b) Summarize the procedure for free surface moisture determination on sand in the field level. (06)
- (c) Briefly describe the following terms: (i) Mean size (ii) Flaky particle (iii) Sphericity (iv) Angularity number (12)
- (d) What is fineness modulus? Sieve analysis of two different varieties of sand, one from Savar and other from Durgapur are given below in the table. Weight of each sample is 1250 gm. Determine the combined fineness modulus of a mixture prepared by using 12 kg of Savar sand and 12 kg of Durgapur sand. (12)

Table: Sieve analysis data

Sieve size	Savar sand	Durgapur sand
	Weight retained (gm)	Weight retained (gm)
No. 4	50.00	0.00
No. 8	150.00	50.00
No. 16	100.00	200.00
No. 30	360.00	150.00
No. 50	460.00	225.00
No. 100	130.00	625.00

8. (a) Define mortar? State the functions of sand and surki in mortars. (10)
- (b) Comparison between Bull's trench kiln and Hoffman's kiln. (08)
- (c) Discuss the characteristics of ultra-violet and laminated glass in building application? What are the uses of timber in construction industry? (08)
- (d) What precautions should be considered for mortar in field application? Write down the purposes of plastering in the construction works? (09)

Khulna University of Engineering & Technology
 Department of Building Engineering & Construction Management
 B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2018
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 order and degree of differential equations. Find the differential equation of the family of curves, $xy = ae^x + be^{-x} + x^2$ where a and b are arbitrary constants. (12)
- (b) Solve $\frac{dy}{dx} = \sin(x + y) + \cos(x + y)$ (11)
- (c) Solve $(2x + 3y - 2)dx - (4x + 6y - 4)dy = 0$ (12)

2. (a) Solve $y'' + 4y' - 5y = e^{-5x} + 2 \cos 2x$ (11)
- (b) Solve $(D^2 + 8D + 16)y = xe^{-4x} \sin x$ (13)
- (c) Solve $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = 4x^2$ (11)

3. (a) Solve $(x + 1)^2 \frac{d^2y}{dx^2} + (x + 1) \frac{dy}{dx} = (2x + 3)(2x + 4)$ (12)
- (b) Solve $y'' + 4y' + 5y = e^{-2x} \sec x$ by variation of parameter. (13)
- (c) Solve $\frac{\partial u}{\partial y} = c \frac{\delta u}{\delta x}$ subject to the condition $u(x, 0) = 3e^{-2x}$ (10)

4. (a) Define general solution and particular solution with examples and find a particular solution of $y'' + 2y' + 2y = 3$ when $y(0) = 1$ and $y'(0) = 2$ (15)
- (b) Solve, $\frac{\partial^2 y}{\partial t^2} = 16 \frac{\partial^2 y}{\partial x^2}$, $0 < x < 2, t > 0$ subject to the conditions $y(0, t) = 0 = y(2, t)$, $y_t(x, 0) = 0$, $y(x, 0) = 6 \sin \pi x - 3 \sin 4\pi x$, $y(x, t) < M$

Section – B

5. (a) Find cartesian and spherical polar coordinates of a point whose cylindrical polar coordinates are $(3, \frac{2\pi}{3}, 4)$. (10)
- (b) Define direction cosines and direction ratios of a line. Prove that, the sum of the square of the direction cosines of every line is unity. (12)
- (c) Find the acute angle between the lines whose direction cosines are given by the relations $l + m + n = 0$ and $l^2 + m^2 - n^2 = 0$ (13)
6. (a) A line makes angles a, b, c, d with the four diagonals of a cube, prove that (13)
$$\sin^2 a + \sin^2 b + \sin^2 c + \sin^2 d = \frac{8}{3}$$
- (b) Find the equation of the plane passing through the lines of intersection of the planes $x + y + 2z = 0$ and $2x + y - 2z + 2 = 0$ and which is perpendicular to the plane $4x + 3y - z + 1 = 0$ (12)
- (c) Find the angle between the planes $x + 2y + 3z + 5 = 0$ and $2x + 4y + 6z + 1 = 0$ (10)
7. (a) Determine the distance of the point $(1, 1, 1)$ from the point where the line $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-2}{6}$ cuts the plane $4x - 3y + 2z + 6 = 0$ (10)
- (b) Define skew line. Find the shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$, $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$. Find also equation and the points in which it meets the given lines. (15)
- (c) Test whether the lines $\frac{x+1}{2} = \frac{y-2}{2} = \frac{z}{1}$ and $\frac{x-1}{6} = \frac{y+1}{1} = \frac{z-3}{5}$ are coplanar or not. (10)
8. (a) Find the equations of the two sphere which passes through the circle $x^2 + y^2 + z^2 - 4x - y + 3z + 12 = 0$, $2x + 3y - 7z - 10 = 0$ and touches the plane $x - 2y + 2z = 1$. (12)
- (b) Obtain the equations of the tangent planes to the sphere $x^2 + y^2 + z^2 + 6x - 2z + 1 = 0$ which pass through the line $\frac{16-x}{2} = \frac{z}{2} = \frac{y+15}{3}$ (12)
- (c) Find the equation of a sphere for which the circle $x^2 + y^2 + z^2 + 7y - 2z + 2 = 0$, $2x + 3y + 4z = 8$ is a great circle. (11)
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Khulna University of Engineering & Technology
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B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2018

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) Define the term "magnetic orbital quantum number". If $l = 3$, hence draw the permitted orientations of the l vector with the field direction B . (06)
- (b) Write down the basic postulates of Bohr's atom model. (04)
- (c) Show that, the total energy of the electron in n^{th} orbit is, $E_n = -\frac{me^4z^2}{8\epsilon_0^2n^2h^2}$, (15)
where the symbols have their usual meanings.
- (d) If the Rydberg constant is $R = 1.097 \times 10^7 \text{ m}^{-1}$, then calculate the wavelength of the least energetic photon and the wavelength of the series limit for the Balmer series. In which regions of spectrum these wavelength lies? (10)
2. (a) Define photo-electric effect and Threshold frequency. (05)
- (b) Derive Einstein photo-electric equation. (15)
- (c) Derive expression for De-Broglie wave-velocity, hence point out the wrong on this value. (10)
- (d) Calculate the energy needed for an electron to be confined to an atom. (05)
3. (a) Why the vector atom model was introduced instead of Bohr's atom model? (06)
- (b) Define the following terms (i) Magnetic Susceptibility (ii) Magnetic Permeability (iii) Diamagnetism and (iv) Ferromagnetism. (12)
- (c) Graphically represent the effect of potential on photoelectric current and hence define saturation current and stopping potential. (07)
- (d) The photoelectric threshold for a metal is 3000 \AA . Find the kinetic energy of an electron ejected from it by radiation of wavelength 1200 \AA . (10)
4. (a) In which crystal, the two lengths of the unit cell are equal while the third one is longer and the three axes are perpendicular to each other. (02)
- (b) Show that, FCC cell is a non-primitive unit cell. (04)
- (c) Draw the following planes in cubic crystal: (i) (001) (ii) (011) and (iii) (100). (09)
- (d) For BCC structure find (i) atomic radius, (ii) no. of atoms per unit cell, (iii) volume of the atoms in unit cell, (iv) volume of unit cell, (v) Packing fraction. (10)
- (e) Calculate the glancing angle on the cube (110) of a rock salt crystal ($a = 2.81 \text{ \AA}$) corresponding to second order diffraction maximum for the X-rays of wavelength 0.71 \AA . (10)

Section – B

5. (a) What is meant by packing fraction and binding energy of nucleus? (06)
(b) Write down the basic conditions for secular and transient equilibrium. (06)
(c) State the laws of radioactive disintegration and hence find the relation (13)
between mean life and decay constant.
(d) 1 gram of a radioactive substance disintegrates at the rate of 3.7×10^{10} (10)
disintegrations per second. The atomic weight of the substance is 226.
Calculate its mean life.
6. (a) In case of successive disintegration, derive an expression for the amount of (20)
daughter element; hence derive the expression of time when number of
daughter will be maximum.
(b) Write down the uses of radio-activity. (10)
(c) 1 gram of radium is reduced by 2.1 mg in 5 years by α – decay. Calculate the (05)
half life of radium.
7. (a) Prove that the distance between any two consecutive dark fringes is equal to (20)
that of bright fringes.
(b) Discuss the color of central ring due to reflected and transmitted light. (10)
(c) Deduce the missing orders for a double slit fraunhofer diffraction pattern, if the (05)
slit widths are 0.16 mm and they are 0.8 mm apart.
8. (a) Prove that light is a transverse wave. (10)
(b) Using Brewster's law, prove that reflected and the refracted rays are at right (12)
angle to each other.
(c) Define photometry and lumen. (04)
(d) Calculate angle of polarization of a material whose refractive index is 1.52. (04)
(e) Explain optical activity. (05)
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Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 1st Year 2nd Term Regular Examination, 2018
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) "Sociology is the scientific study of human behavior and social groups"- do you agree? Give reason in favor of your opinion. (10)
- (b) Describe contribution of Auguste Comte and Herbert Spencer behind origin and development of Sociology as a distinct discipline. (10)
- (c) Is Sociological Knowledge important for the student of BECM? Explain in the light of your own society. (15)
2. (a) What is meant by Sociological perspective? Explain conflict perspective with example. (15)
- (b) What do you mean by Society? Explain distinctive features of society with example. (10)
- (c) Define culture. Narrate the characteristics of culture. (10)
3. (a) Define family. Critically explain changing role of family and marriage. (15)
- (b) Describe the characteristics and functions of social institution. (20)
4. (a) What is meant by socialization? Describe role of family and social communication media as agent of Socialization. (20)
- (b) What is meant by marriage? Describe the different types of marriage. (15)

Section – B

5. (a) What do you understand by social structure? (05)
- (b) Describe the elements of social structure. (10)
- (c) Explain the Marx's concept of social structure. (20)
6. (a) What is social stratification? (05)
- (b) Describe the types of social stratification. (20)
- (c) What is community? Mention the characteristics of community. (10)
7. (a) What is Social Control? Describe role of distinctive social institutions in social control. (15)

- (b) What do you mean by social change? Explain factors of social change in Bangladesh. (10)
- (c) Describe rural-urban convergence with example. (10)
8. (a) What is industrialization and urbanization? (10)
- (b) Describe the impacts of industrialization and urbanization on society. (25)
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