BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-1/T-1   B. Sc. Engineering Examinations 2011-2012
Sub : HUM 375 (Government)
Full Marks : 140   Time : 3 Hours
The figures in the margin indicate full marks.
USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A
There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) What are the essential elements of a state? Make a comparative discussion on society and state.   (11⅓)

(b) Define sovereignty. Discuss various types of sovereignty with examples.   (12)

2. (a) What is the significance of the concept nationalization *(nationalism?)*? Analyze the merits of nationalism.   (11⅓)

(b) How do you define constitution? What are the qualities of best constitution?   (12)

3. (a) Analyze the functions of legislature in a state.   (11⅓)

(b) Discuss the advantageous and disadvantageous of parliamentary form of government. (12)

4. (a) What is good governance? Explain the agenda for good governance.   (11⅓)

(b) Define bureaucracy. Examine Max Weber's "Ideal Type of Bureaucracy."   (12)

SECTION – B
There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Explain the major characteristics of the constitution of Bangladesh.   (11⅓)

(b) Discuss the significance of language movement of 1952.   (12)

6. (a) Review the external and internal determinations *(nts)* of foreign policy of Bangladesh. (11⅓)

(b) Examine the principle of Marxism with relevant criticism.   (12)

7. (a) What is NGO? Discuss the development activities of NGOs in Bangladesh.   (11⅓)

(b) Define e-government. Explain the positive aspects of e-government in development management of a state.   (12)

8. (a) What is meant by public policy? Review different models to the study of public policy.   (11⅓)

(b) What is UNO? What do you know about the principal organs of United Nations Organization?   (12)

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Sc. Engineering Examinations 2011-2012

Sub : **HUM 375** (Government)

Full Marks : 140   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

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SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Explain the major characteristics of the constitution of Bangladesh.   (11⅓)

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8. (a) What is meant by public policy? Review different models to the study of public policy.   (1⅓)

   (b) What is UNO? What do you know about the principal organs of United Nations Organization?   (12)

L-1/T-1/CE   Date : 29/12/2012

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Sc. Engineering Examinations 2011-2012

Sub : **HUM 355** (Sociology)

Full Marks : 140   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) What is sociological imagination? Why do sociologists maintain a value neutral position for studying social relationships? Explain with examples.   **(7+8)**

   (b) How does sociology differ from the branches of social sciences?   **(8⅓)**

2. (a) What are the elements of culture? How is globalization influencing changes in each of the elements of culture? Explain with some practical examples.   **(10)**

   (b) What does socialization mean? How does socialization shape human behaviour? Discuss in the context of nature versus nurture debate.   **(13⅓)**

3. (a) What is social stratification? Explain the nature of caste system of social stratification.   **(10)**

   (b) Discuss Marxist theory of social stratification.   **(13⅓)**

4. Write short notes on any three of the following: **(23⅓)**

   (a) Dominant ideology and counter culture

   (b) Ethnocentrism.

   (c) Types of socialization.

   (d) Mass Media.

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) How do you define man-made environment?   **(3⅓)**

   (b) Define greenhouse gases? What are the main sources of global warming?   **(12)**

   (c) Briefly describe the 'disposable society'.   **(8)**

6. (a) What do you know about capitalism? Write down the positive and negative consequences of capitalism.   **(13)**

   (b) What is meant by city? Describe the factors that have led to the growth of cities.   **(10⅓)**

7. (a) How do you define social problem? Define crime, deviance and while collar crime with examples.   **(8⅓)**

   (b) Discuss the causes of crime.   **(8)**

   (c) Briefly discuss the classification of cities with examples.   **(7)**

HUM 355(CE)

8. Write short notes on any three of the following:

   (a) Sources of social change.

   (b) Classification of different industrial unit.

   (c) The major functions of the family.

   (d) Consequences of global warming.

L-1/T-1/CE   **Date : 17/11/2012**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Sc. Engineering Examinations 2011-2012

Sub : **CE 101** (Analytic Mechanics)

Full Marks : 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) The frame shown in Fig. 1 consists of two vertical members AE and BD, a horizontal member CD and an inclined member DE. All the members are assumed to be weightless.   **(13)**

       (i) Identify the two force member(s).

       (ii) Calculate the components of pin reactions at A.

       (iii) Determine the axial force in the two force member(s).

(b) A long concrete flood wall of height 26 ft and thickness 5 ft retains water up to a depth of 21 ft. Unit weight of concrete and water are 150 lb/ft^3 and 62.5 lb/ft^3, respectively. Compute the Factor of Safety (F.S.) of the wall. Is the wall stable enough to resist the lateral thrust of the retained water?   **(10)**

(c) The body A in Fig. 2 weighs 100 lb. The coefficient of static friction between the body A and the inclined plane is 0.4. The coefficient of static friction between the rope and drum 1 is 0.3 while it is 0.5 between the rope and drum 2. What value of W will cause motion of the body A to impend up the plane?   **(12)**

2. (a) A right-angle bend pipe as shown in Fig. 3 has been supported in a horizontal plane with the help of three vertical wires AB, CD and EF. The pipe weighs 40 kg/metre. Calculate the values of tension in the wires AB, CD and EF.   **(10½)**

(b) A bar of weight 100 lb is hinged to a vertical wall at A and has been supported by a cable as shown in Fig. 4. Determine the components of pin reactions at A and C.   **(12½)**

(c) A flexible cable weighing 3 lb/ft is strung between two supports. One support is 100 ft higher than the other and the sag measured from the lower support is 50 ft. The tension in the cable at the upper support is 15000 lb. Calculate the following: **(12)**

       (i) Distance between the two supports

       (ii) Minimum tension in the cable

       (iii) Slope in degree at the upper support

       (iv) Length of the cable.

CE 101

3. (a) For the truss shown in Fig. 5, find the force in the members bi, cd, dg and gf. **(12)**

(b) Using direct integration, determine the coordinates of the centroid of the area bounded by the parabola $y^2 = 16x$ and the straight line $y = 2x$. **(11)**

(c) Fig. 6 shows a boom made of two timbers AB and AC. The cable AE holds the timbers in a horizontal plane and supports a vertical load of 1500 lb. The line BC is the intersection of the horizontal plane of the boom with the vertical plane BCGF. Determine the force in the timbers AB and AC and tension in the cable AE. Given, AB = 12′, AC = 15′, AD = 8′ and DE = 10′. **(12)**

4. (a) In Fig. 7, the bodies A and B weigh 500 N and 1000 N, respectively. The coefficient of static friction for all surfaces is 0.3. The cord is parallel to the inclined plane CD. Calculate the angle θ and tension in the cord when motion of the body B impends down the plane CD. **(12)**

(b) Derive an expression for the span length of a symmetrical catenary in terms of sag (d), weight per foot (w) and tension at the low point (Q). **(11)**

(c) A slender brass rod of uniform cross-section has been welded at the centre of the base of a cast-iron cone as shown in Fig. 8. Weight of the rod and unit weight of cast-iron are 20 lb and 490 lb/ft^3, respectively. Calculate the radius of gyration of this composite mass with respect to y′ axis. **(12)**

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

Assume reasonable value (values) for missing data only.

5. (a) The a-s (acceleration vs. distance) graph (Fig. 9) for a rocket moving along a straight horizontal track has been experimentally determined. If the rocket starts from rest, determine its speed at the instants, S = 50 ft, 150 ft and 200 ft, respectively. **(12)**

(b) A train runs at a speed of 120 km/hr in a curve track of radius 900 m. The application of brakes suddenly, causes the train to slow down at a constant rate. After 6 seconds, the speed has been reduced to 72 km/hr. Determine the acceleration of the train immediately after the brake is applied. **(12)**

(c) Calculate the moment of inertia of the shaded area as shown in Fig. 10 about the line y = 8 inch. **(11)**

CE 101

6. (a) A load 'W' of magnitude 900 N is applied to the linkage at B (Fig. 11). Neglecting the weight of the linkage and knowing that $l = 225$ mm, determine the value of θ corresponding to equilibrium using the principle of virtual work. **(23)**

   The spring constant k = 2 kN/m and the spring is unstretched when AB and BC are horizontal.

   (Hint: Solve the equation obtained for θ by trial)

   (b) Determine the centroidal location ($\bar{x}, \bar{y}$) of the shaded area shown in Fig. 12. **(12)**

7. (a) A block of weight 12 N falls at a distance of 0.75 m on the top of a spring (Fig. 13). Determine the spring constant if it is compressed by 200 mm to bring the weight momentarily stop. **(12)**

   (b) Two weights 800 N and 200 N are connected by a thread and move along a rough surface (Fig. 14) under the action of force 400 N. Calculate the acceleration of the weights and the tension in the thread using D' Alemberts principle. Assume coefficient of friction is 0.30. **(12)**

   (c) Derive an expression for the mass moment of inertia of a homogeneous right circular cone about its geometrical axis by direct integration. **(11)**

8. (a) A 200 lb body is moving toward the left with a velocity $v_1 = 50$ ft/sec at the instant that a force Q = 50 lb acting toward the right (Fig. 15) is applied. There is a constant resistance to motion F = 50 lb. What is the body's velocity after 15 sec? **(12)**

   (b) A ball is dropped from a height of 13.5 m on a smooth horizontal floor, from which it rebounds to the height of 8.64 m. The ball again strikes the floor and rises to an unknown height. Calculate the unknown height. **(12)**

   (c) A cylindrical oil drum is pulled by a force 'Q' as shown in Fig. 16. The drum weighs 1800 N. The value of coefficient of static friction for all surfaces is 0.50. Calculate 'Q', when the drum just starts spinning. **(11)**
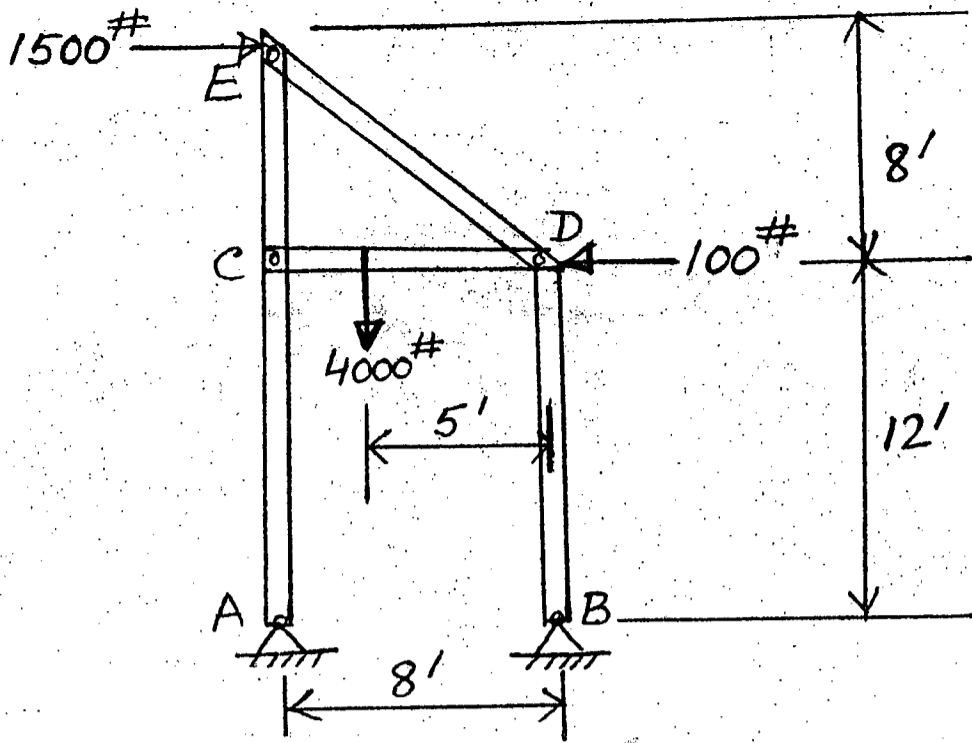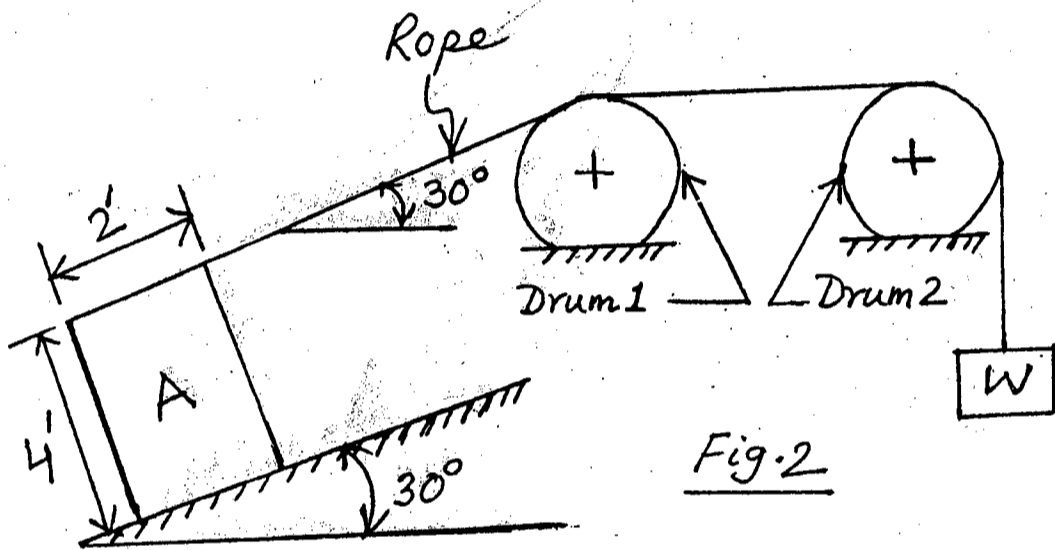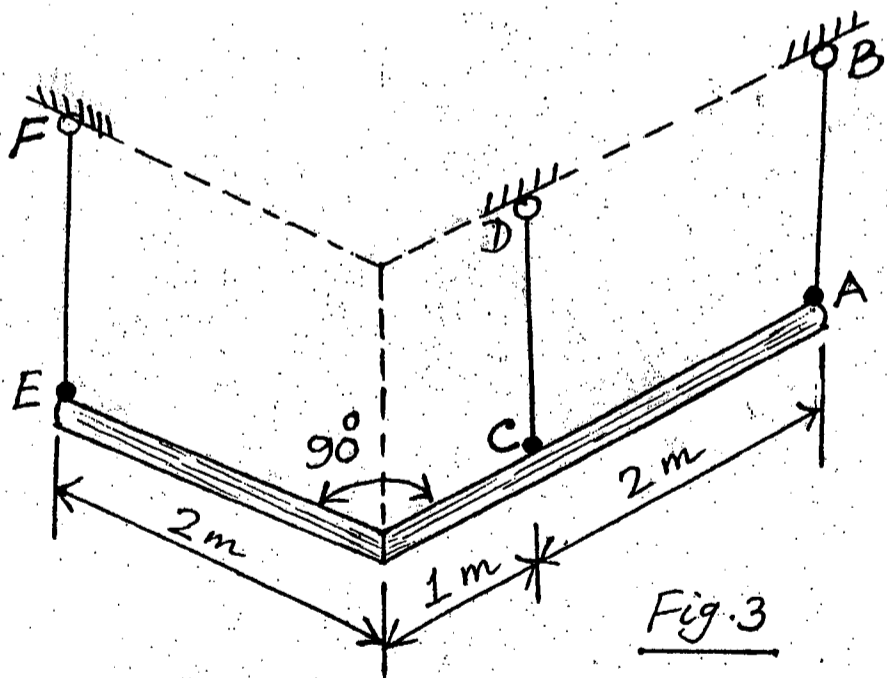

Fig·1

$1500^{\#}$

E

C

$4000^{\#}$

D

$100^{\#}$

$8'$

$5'$

$12'$

A

B

$8'$

Fig·1

Rope

$2'$

$4'$

A

$30°$

$30°$

Drum 1

Drum 2

W

Fig·2

F

B

D

A

E

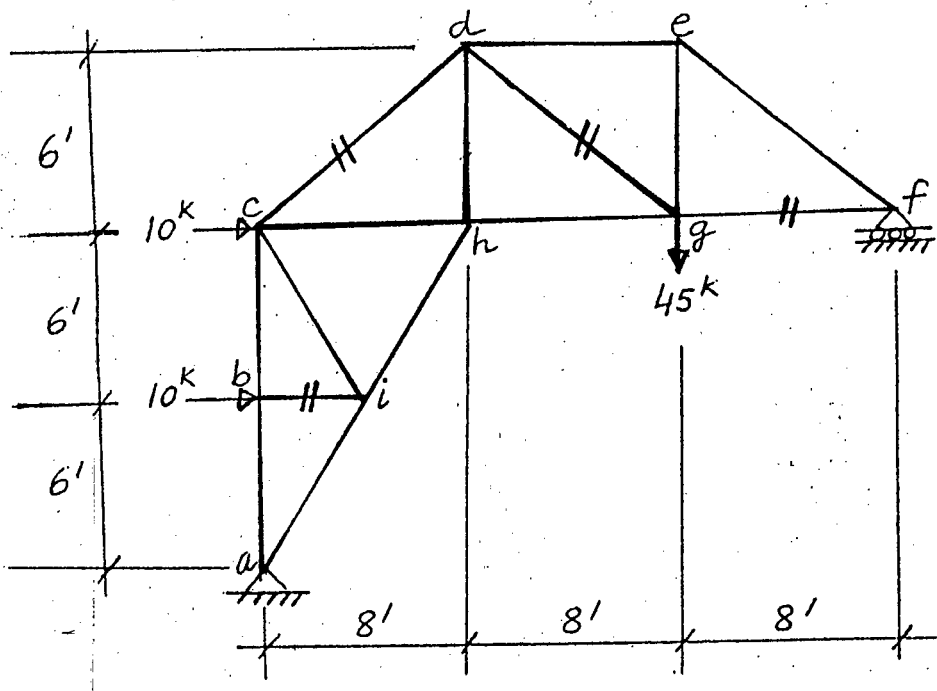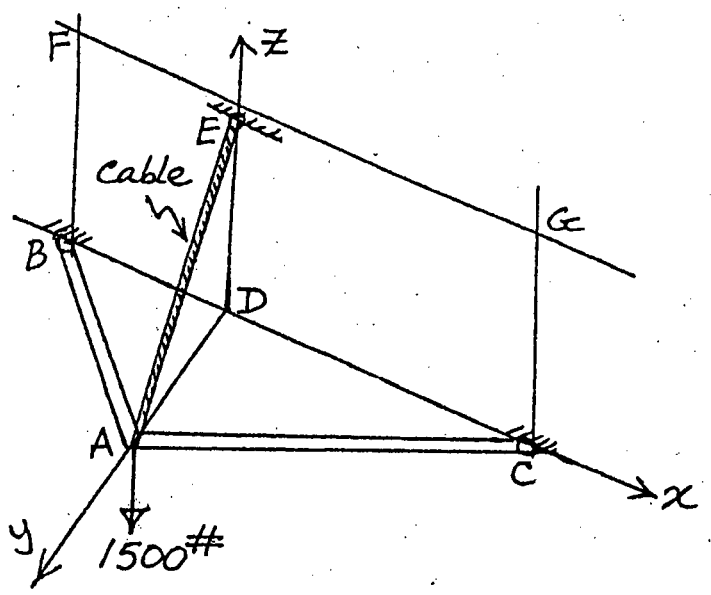$90°$

C

$2m$

$2m$

$1m$

Fig·3
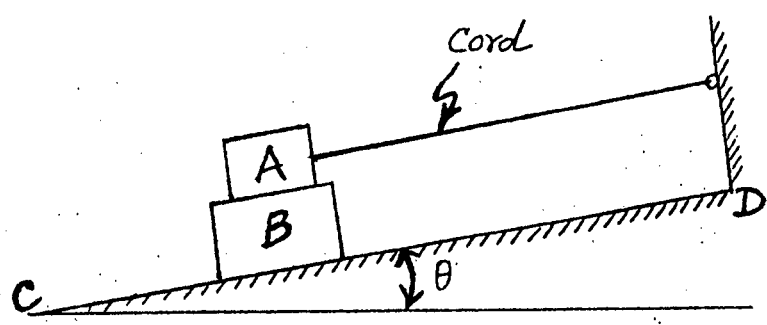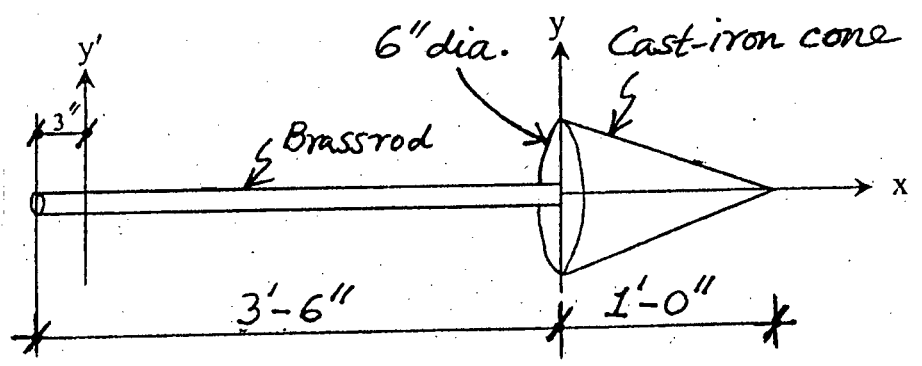
C

wall

4
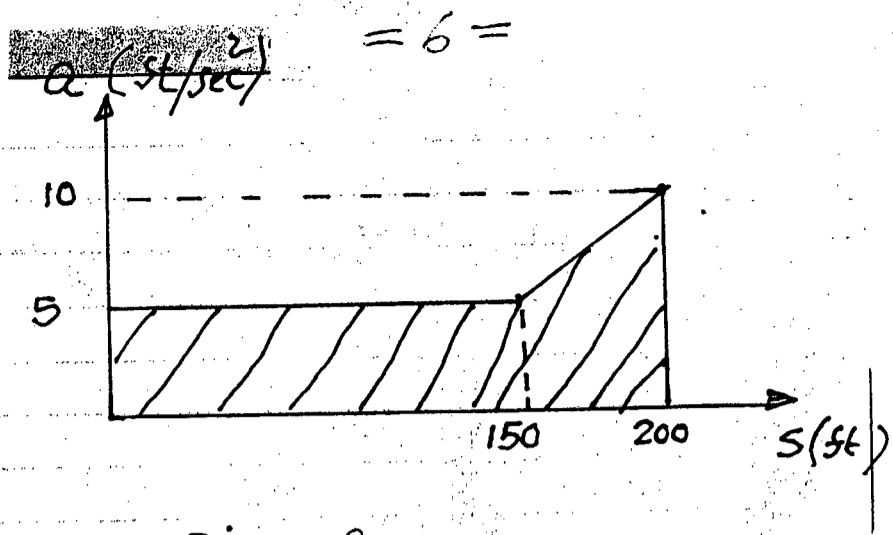
3

Cable

A

$60°$

bar

B
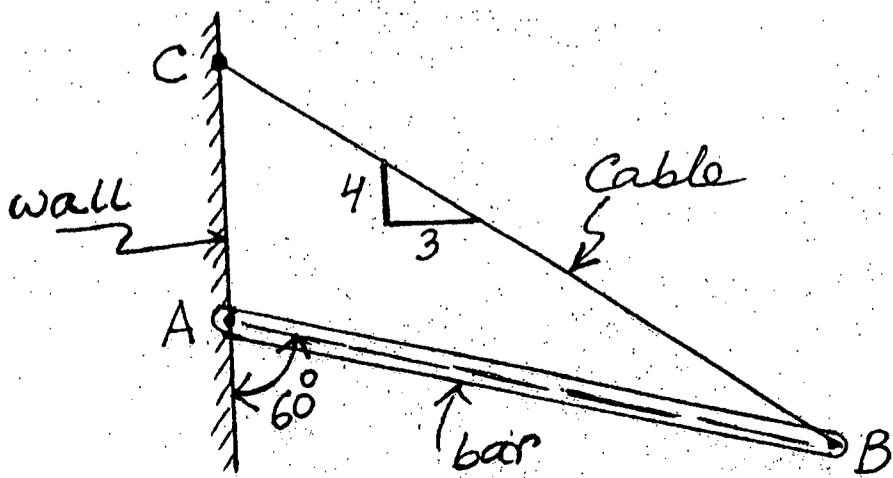
Fig·4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9
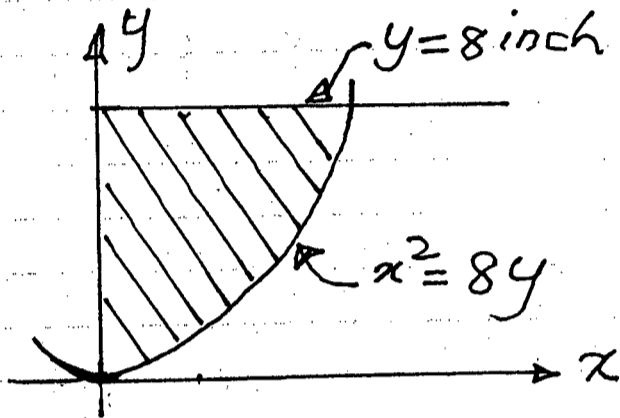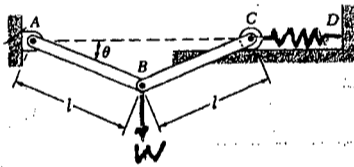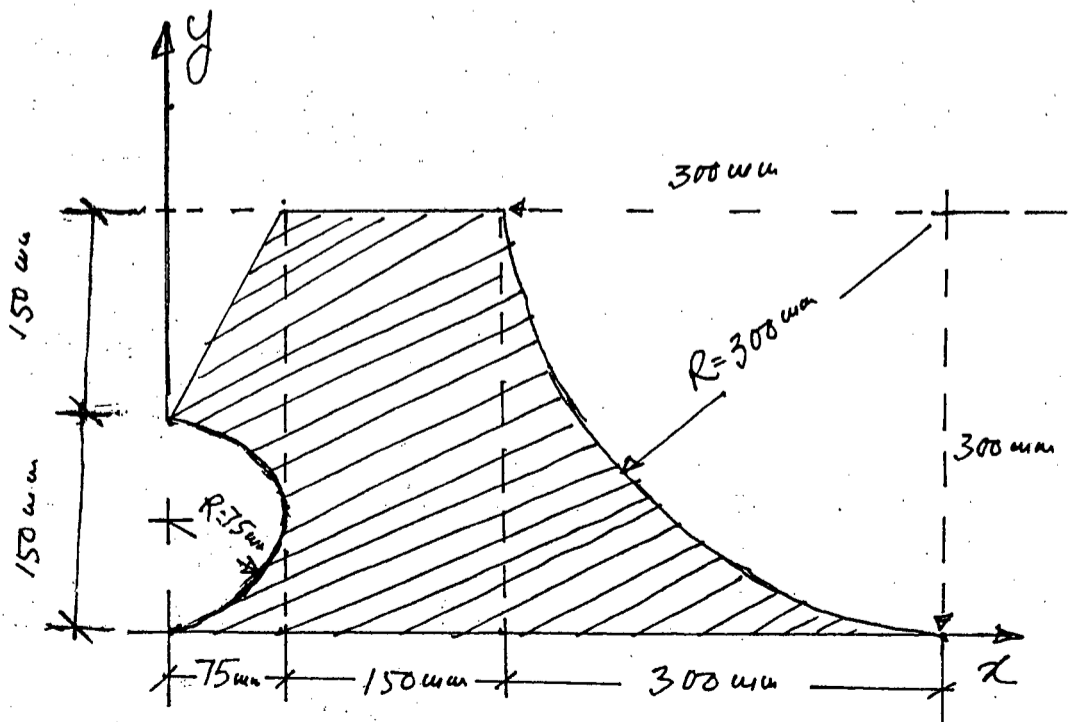

Fig. 10

Fig. 11

Fig. 12
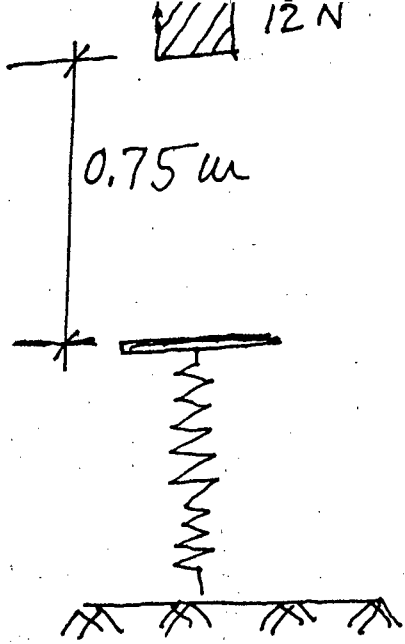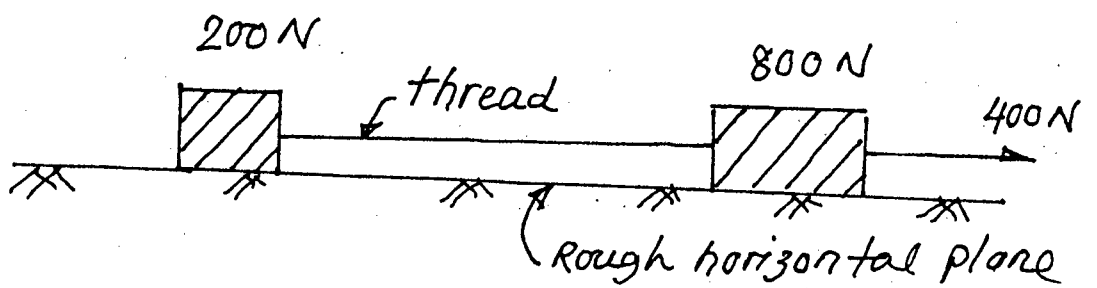
$=+=$

A 12 N

0.75 m

Fig. 13

200 N   thread   800 N   400 N

Rough horizontal plane

Fig. 14

$v_1 = 50$ ft/sec

Q $W = 200\,lb$ F

Fig. 15

Q

Cylindrical
oil drum.
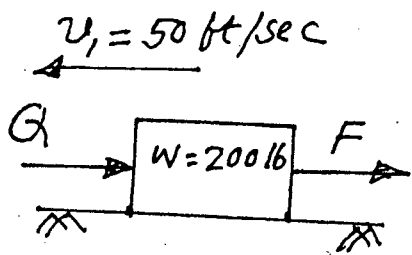
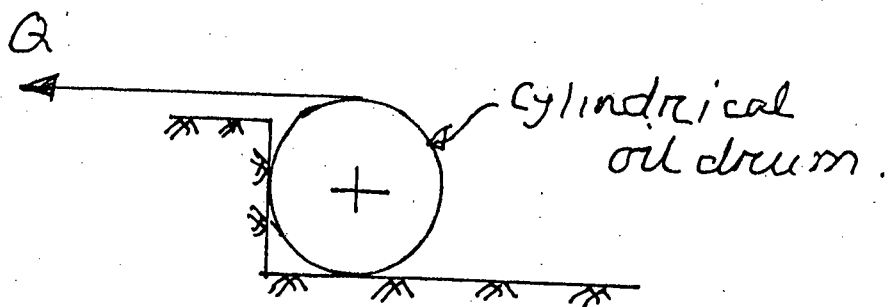Fig. 16

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-1/T-1   B. Sc. Engineering Examinations 2011-2012

Sub : **PHY 101** (Physical Optics, Waves and Oscillation, Heat and Thermodynamics)

Full Marks : 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) What are coherent sources? How are they obtained in practice?   **(5)**

   (b) Describe the phenomenon of interference in thin films. Obtain the conditions for constructive and destructive interference due to reflected light from a thin film enclosed by parallel plates.   **(20)**

   (c) A soap film of refraction index 1.33 and thickness 1.55×10^{-4} cm is illuminated by white light incident at an angle of 60°. The light reflected by it is examined by a spectroscope in which is found a dark band corresponding to a wavelength of 5.22×10^{-5} cm. Calculate the order of interference of the dark band.   **(10)**

2. (a) What is the difference between interference and diffraction of light? What do the interference and diffraction of light tell us about the nature of light?   **(7)**

   (b) Explain clearly what is meant by resolving power of an optical instrument and deduce an expression for resolving power of a telescope.   **(20)**

   (c) Calculate the diameter of the circular aperture of the objective of a telescope which may be used to resolve stars separated by 5.0×10^{-6} radian for light of wavelength 6000 Å.   **(8)**

3. (a) State and explain Malus' law of polarization.   **(10)**

   (b) What are retardation plates? Deduce the expressions of thickness for quarter wave plate and half wave plate.   **(20)**

   (c) Calculate the thickness of a quarter wave plate and half wave plate for a wave length of 5893 Å. The refractive indices of ordinary and extra ordinary rays are 1.544 and 1.533, respectively.   **(5)**

4. (a) Prove that no engine can be more efficient than a Carnot engine working between the same two temperatures.   **(10)**

   (b) Deduce the Maxwell's thermodynamics relations.   **(15)**

   (c) A Carnot engine working as a refrigerator between 250 k and 300 k receives 1000 cal of heat from the reservoir at the lower temperature. (i) Calculate the amount of heat rejected to the reservoir at the higher temperature, (ii) Calculate the amount of work done in each cycle to operate the refrigerator.   **(10)**

PHY 101(MME)

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) What do you understand by r.m.s velocity of the molecules of a gas? How do you interpret (i) Pressure and (ii) temperature on the basis of the kinetic theory of gases. **(14)**

(b) Explain the term 'mean free path' of a molecule of a gas. Obtain an expression for the mean free path of a molecule in terms of its mass, diameter and density of the gas. **(13)**

(c) At what temperature is the r.m.s speed of hydrogen molecules equal to that of oxygen molecules at 63°C? **(8)**

6. (a) Define entropy. Draw the P-V and T-S diagrams for a Carnot cycle. Deduce the efficiency of the cycle using the T-S diagram. **(10)**

(b) Obtain expressions for the change in entropy of a gas when it is heated (i) at constant volume (ii) at constant temperature and (iii) in a general manner. **(13)**

(c) Calculate the increase in entropy when 1 gm of ice at −10°C is converted into steam at 100°C. Given that specific heat of ice = 0.5, latent heat of ice = 80 cal/g, latent heat of steam = 540 cal/g. **(12)**

7. (a) What is simple harmonic motion(SHM)? Show that the total energy of a particle vibrating simple harmonically is proportional to the square of the frequency of vibrations. **(10)**

(b) Suppose an object of mass M is placed midway between the two springs A and B on a frictionless surface. One end of both springs is attached by two opposite rigid walls and the other end of both springs is connected to M. Prove that the oscillations of M execute simple harmonic motion.   ᵥ mass **(15)**

(c) A particle performs SHM given by the equation **(10)**

$$y = 15 \sin (wt + \alpha)$$

If the time period is 25s and the particle has a displacement of 8 cm at t = 0, find (i) epoch (ii) the phase angle at t= 3s and (iii) the phase difference between two positions of the particle 12 sec. apart.

8. (a) What are wave velocity and particle velocity? Obtain a relation between them. **(8)**

(b) How the energy of a progressive wave is transferred through the medium? Show that the energy of a plane progressive wave is given by $E = 2\pi^2 \rho n^2 a^2 v$, where ρ = density of the medium, n = frequency, a = amplitude and v = velocity. **(17)**

(c) The velocity of a simple harmonic wave is 30 cm/s. At a time t = 0 the displacement of a particle is given $y = 4 \sin 2\pi(x/150)$. Find the equation for the displacement at a time t = 3s. **(10)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-1/T-1   B. Sc. Engineering Examinations 2011-2012

Sub : **MATH 137** (Differential and Integral Calculus and Matrices)

Full Marks: 210   Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) A function $f(x)$ is defined as follows: **(17)**

$$f(x) = \begin{cases} 5x - 4 & \text{when } 0 < x \le 1 \\ 4x^2 - 3x & \text{when } 1 < x < 2 \\ 3x + 4 & \text{when } x \ge 2. \end{cases}$$

Discuss the continuity of $f(x)$ at $x = 1$ and the existence of differentiability of $f(x)$ at $x = 2$. Sketch the graph of $f(x)$ as well.

(b) Evaluate: $\displaystyle\lim_{x \to 0} \frac{x - \sin^{-1} x}{\sin^3 x}$.   **(10)**

(c) Expand $\tan\left(\pi/4 + x\right)$ in a series of ascending powers of x.   **(8)**

2. (a) If u be a function of r alone, where $r^2 = x^2 + y^2 + z^2$ then prove that   **(13)**

$$u_{xx} + u_{yy} + u_{zz} = \frac{d^2 u}{dr^2} + \frac{2}{r}\frac{du}{dr}.$$

(b) If $y = \dfrac{1}{2}\left(\tan^{-1} x\right)^2$ then find the value of $y_{n+2}(0) + 2n^2 y_n(0) + n(n-1)^2(n-2)y_{n-2}(0)$.   **(12)**

(c) Find the pedal equation of the curve $\dfrac{2r}{a} = 1 - \cos\theta$.   **(10)**

3. (a) If $lx + my = 1$ is the normal to the parabola $y^2 = 4ax$ then show that $al^3 + 2alm^2 = m^2$.   **(11)**

(b) In the Mean value theorem $f(a + h) - f(a) = hf'(a + \theta h)$, $\quad 0 < \theta < 1$, if $f(x) = \dfrac{1}{3}x^3 - \dfrac{3}{2}x^2 + 2x$ and $a = 0$, $h = 3$, show that θ has two values and find them.   **(11)**

(c) Find the greatest volume of the cylinder that can be inscribed in a sphere of radius a.   **(13)**

4. Work out the following integrals:

(a) $\displaystyle\int \frac{\sin^{-1} x}{\left(1 - x^2\right)^{3/2}}\, dx$ **(11)**

(b) $\displaystyle\int \frac{dx}{\left(x^2 + 1\right)\sqrt{x^2 + 4}}$ **(12)**

(c) $\displaystyle\int \frac{\cos x}{5 - 3\cos x}\, dx$ **(12)**

MATH 137

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. Evaluate the following:

   (a) $\displaystyle\int_{3}^{29} \frac{(x-2)^{\frac{2}{3}}}{(x-2)^{\frac{2}{3}}+3}\,dx$ **(10)**

   (b) $\displaystyle\int_{0}^{\pi} \frac{x\tan x}{\sec x+\tan x}\,dx$ **(12)**

   (c) $\displaystyle\int_{1}^{\infty} \frac{\tan^{-1} x}{1+x^2}\,dx$ **(13)**

6. (a) Prove that $\Gamma(1/2)=\sqrt{\pi}$. **(11)**

   (b) Evaluate: $\displaystyle\int_{0}^{\frac{\pi}{2}}\int_{0}^{\frac{\pi}{3}}\int_{0}^{4\cos\theta} r^3 \sin\theta \sin\phi\,dr\,d\theta\,d\phi$. **(12)**

   (c) Transform the integral $\displaystyle\int_{0}^{1}\int_{x}^{1} xy\,dy\,dx$ by using the relations $x = u + v$ and $y = u - v$.

   Hence evaluate it. **(12)**

7. (a) Find the rank of the matrix **(17)**

   $$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 7 & 3 & 5 \\ 3 & 8 & 1 & -2 \\ 2 & 4 & 6 & 8 \end{bmatrix}$$

   by reducing it to canonical form.

   (b) Reduce $A = \begin{bmatrix} 1 & 2 & -1 & 2 \\ 3 & 1 & -2 & -1 \\ 4 & -3 & 1 & 1 \end{bmatrix}$ to the normal form B and obtain the non-singular

   matrices P and Q such that PAQ = B. **(18)**

8. (a) Using matrix solve the following system of equations: **(17)**

   $$x_1 + 2x_2 - x_3 - 3x_4 = 4$$
   $$2x_1 + 5x_2 + 2x_3 - 4x_4 = 6$$
   $$3x_1 + 7x_2 + x_3 - 6x_4 = 10$$

   (b) Find all eigen values and corresponding eigen vectors of the matrix: **(18)**

   $$A = \begin{bmatrix} 2 & 2 & -2 \\ 2 & 3 & -1 \\ -2 & -1 & 3 \end{bmatrix}.$$

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1   B. Sc. Engineering Examinations 2011-2012

Sub : **CHEM 103** (Chemistry I)

Full Marks : 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Define colloid and distinguish between colloidal solution and colloidal mixture.   **(5)**

    (b) Explain why the sky looks blue on sunny day but looks red while sun sets.   **(5)**

    (c) Describe the preparation of arsenic (iii) sulphide sol by chemical method and gold sol by Bredig's arc method.   **(10)**

    (d) Distinguish between lyophobic sol and lyophilic sol.   **(5)**

    (e) Describe the different techniques used in purification of colloid.   **(10)**

2. (a) Define portland cement. Classify raw materials of manufacturing portland cement. Describe each class of raw material with suitable examples.   **(12)**

    (b) Give a flow diagram of different steps involved in manufacturing portland cement.   **(5)**

    (c) What is retarder? Why is it an essential additive of portland cement containing relatively larger amount of C_3A. Give an example of a retarder and show by reaction how it works.   **(5)**

    (d) Write the symbols and full names of different constituents of portland cement. Mention their contribution to the heat liberated during setting and hardening.   **(8)**

    (e) Mention the British standard specification of cement.   **(5)**

3. (a) Discuss the causes of formation of sludge and scales in a boiler. How can be the formation of sludge and scale prevented?   **(10)**

    (b) What are meant by alkali hardness and non-alkaline hardness of water? Discuss with suitable examples.   **(4)**

    (c) Write the principle and the reactions involved in the determination of dissolved oxygen by Winkle's method.   **(10)**

    (d) Discuss the effect of rocks and minerals as the source of impurities of under-ground water.   **(6)**

    (e) Although rain water is regarded as the purest form of water even them it is not considered as the suitable source of industrial or municipal water. why?   **(5)**

CHEM 103(CE)

4. (a) State and explain Molecular Orbital Theory (MOT) for the formation of chemical bond. Discuss how the limitations of Valence Bond Theory (VBT) are over come. **(12)**

(b) Explain bond length and bond energy with the help of potential energy diagram taking the hydrogen molecule as an example. **(5)**

(c) Justify the presence of two neutral hydrogen atoms in a hydrogen molecule. **(6)**

(d) Write down the molecular electronic configuration and draw the molecular orbital diagram for the following species and calculate bond order. **(12)**

  (i) NO^+ (ii) O_2^+ (iii) CO

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) A crystal of NaCl is dropped into water-what would happen? Furnish your answer stressing nature of interaction and forces, energetics and mechanistic aspects involved. **(10)**

(b) What is 'absorption co-efficient'? Give Bunsen's concept on it. Discuss Henry's laws to quantify the solubility of gases in liquids. Using Henry's law, estimate the solubility of oxygen in water at $25°$ C and a partial pressure of 190 torr. $(K_{0_2} = 3.30 \times 10^7 torr)$ **(3+7+5=15)**

(c) What is vapour pressure curve? Draw and discuss the vapour pressure curves when it shows: **(2+8=10)**

  (i) a maximum boiling point

  (ii) a minimum boiling point

6. (a) State mathematically the 'relative lowering of vapour pressure'. Compare vapour pressure of a pure solvent with its dilute solution and thus establish a relationship between the vapour pressure of the solution and mole fraction of the solvent. **(2+3+5+=10)**

(b) Differentiate between 'Ebbuliscopic constant (K_b)' and 'Cryoscopic constant (K_f)'. Comment on the physical significance of the constants. Show mathematically, how molar mass of a solid can be derived using the experimentally obtained k_b value.
The boiling point of benzene is 353.35 K whereas a 0.2 molal naphthalene solution in benzene shows a boiling point of 353.88 K. If 10 g of a non-volatile solute dissolves in 100 g of benzene, then its boiling point is elevated by 0.8 K. Find the molar mass of the non-volatile solute. **(5+5+5=15)**

(c) Compare the concepts of : **(4+6=10)**

  (i) diffusion and osmosis (ii) isotonic solution and hypotonic solution
State osmotic pressure mathematically. How osmotic pressure (Π) is related with the concentration (c) and hydrostatic pressure (h) of a solution? How molecular weight of a solute can be obtained based on the above relationship?

CHEM 103(CE)

7. (a) What is Heisenberg uncertainty principle? Is the principle applicable in case of Bohr atomic model? Justify your answer. **(9)**

(b) Following the periodic law, how can you make a periodic table? **(8)**

(c) Deduce and discuss Schrödinger's wave equation. Explain Eigen values and Eigen functions. **(10+2=12)**

(d) Justify the stability of the nucleus of an atom having all the protons and neutrons in it. **(6)**

8. (a) What are transition elements? How many transition and inner-transition series are there in the periodic table? Write down the atomic numbers of the 1st and last elements of all the transition and inner-transition series. Mention the important properties of the transition elements. **(2+1+4+8=15)**

(b) Discuss the factors that are responsible for the strength of acids and bases. Illustrate your answer with examples. **(8)**

(c) State and explain the hard and soft acids and bases (HSAB) principle. Mention the characteristics of hard and soft acids and bases. **(3+3=6)**

(d) Discuss the application of HSAB principle in the field of medicinal chemistry. **(6)**

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Sub : **HUM 355** (Sociology)

Full Marks : 140   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) What is sociological imagination? Why do sociologists maintain a value neutral position for studying social relationships? Explain with examples.   **(7+8)**

   (b) How does sociology differ from the branches of social sciences?   **(8⅓)**

2. (a) What are the elements of culture? How is globalization influencing changes in each of the elements of culture? Explain with some practical examples.   **(10)**

   (b) What does socialization mean? How does socialization shape human behaviour?   **(13⅓)**

3. (a) Discuss in the context of nature versus nurture debate.   **(10)**

   (b) Discuss Marxist theory of social stratification.   **(13⅓)**

4. Write short notes on any three of the following: **(23⅓)**

   (a) Dominant ideology and counter culture

   (b) Ethnocentrism.

   (c) Types of socialization.

   (d) Mass Media.

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) How do you define man-made environment?   **(3⅓)**

   (b) Define greenhouse gases? What are the main sources of global warming?   **(12)**

   (c) Briefly describe the 'disposable society'.   **(8)**

6. (a) What do you know about capitalism? Write down the positive and negative consequences of capitalism.   **(13)**

   (b) What is meant by city? Describe the factors that have led to the growth of cities.   **(10⅓)**

7. (a) How do you define social problem? Define crime, deviance and while collar crime with examples.   **(8⅓)**

   (b) Discuss the causes of crime.   **(8)**

   (c) Briefly discuss the classification of cities with examples.   **(7)**

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