BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2   B. Sc. Engineering Examinations 2012-2013

Sub : **WRE 103** (Surveying)

Full Marks : 280   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** questions.

1. (a) Write down the advantage and disadvantage of chain Surveying. **(8)**

(b) What types of obstacles a chainman may come across during chain survey? Write down the procedures to overcome those obstacles with examples. **(3+12)**

(c) A big pond obstructs the chain line AB (see Figure 1). A line AL = 1000 m was measured on the left of line AB for circumventing the obstacle. Similarly, another line AM was measured on the right of line AB whose length was 800 m. Points M, B and L are on the same straight line. Lengths of lines BL and BM are 600 m and 400 m respectively. If the chainage at A is 1262.44 m, find the distance AB and the chainage of B. **(10)**
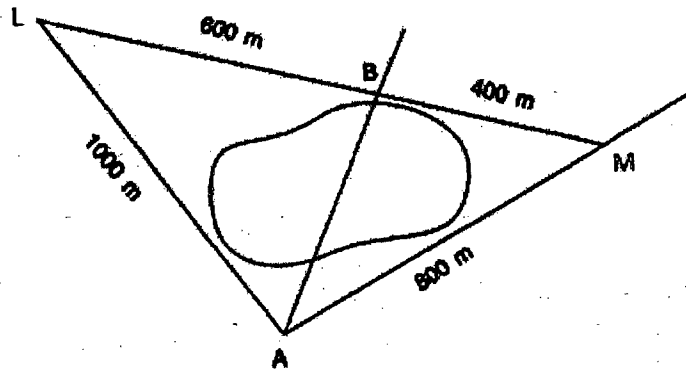

Figure 1 for Q. 1(c)

(d) A 20 m long steel tape, standardized at 55°F with a pull of 9 kg, was used for measuring a base line. Find the correction per tape length, if the temperature at the time of measurement was 80°F and the pull exerted was 18 kg. Given weight of 1 cm^3 of steel = 7.86 gm, E = 2.109 × 10^9 kg/cm^2, weight of tape = 0.8 kg, coefficient of expansion of tape per 1^0 F = 6.2 × 10^{-6}. **(13⅔)**

2. (a) A clockwise traverse ABCDEA was surveyed with the following results:

AB = 101.01 m, BC = 140.24 m CD = 99.27 m, ∠BAE = 128°10'20", ∠CBA = 102°04'30", ∠DCB = 84°18'10", ∠EDC = 121°30'30". The ∠AED and the sides DE and EA could not be measured directly. Assuming no error in survey, find the missing lengths and their bearings if W.C.B of AB is 0°00'. **(23⅔)**

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Contd ... Q. No. 2

(b) Describe the procedure to determine the tachometric constant? Discuss the effect of curvature and refraction in leveling. **(5+8)**

(c) Write down the steps commonly followed for obtaining information about a phenomenon by the use of remote sensing. **(10)**

3. (a) The top (Q) of a chimney was sighted from two stations A and B at different levels. Stations A and B and the top of the chimney are in the same vertical plane. Find the elevation of the top of the chimney from the following data **(14)**

Instrument station	Reading on B. M. (m)	Angle of elevation from instrument station to the top of the chimney	Remarks
A	0.862	18°36'	R.L. of B. M. =421.380 m
B	1.222	10°12'	Distance AB = 50 m

(b) The following observations were made in a tachometric survey:

Inst. station	Height of axis (m)	Staff station	Vertical angle	Hair readings (m)	Remark
A	1.345	BM	– 5°30'	0.905, 1.455, 2.005	RL of BM =450.500 m
A	1.345	B	+ 8°0'	0.755, 1.655, 2.555	
B	1.550	C	+ 10°0'	1.500, 2.250, 3.000	

Calculate the RLs of A, B, C, and the gradient of the line AC. The tachometer is fitted with an anallatic lens and the multiplying constant is 100. **(18⅔)**

(c) Describe the characteristics of contour. **(6)**

(d) Explain the mechanism of an optical square to set out a line at right angle to another line. **(8)**

4. (a) A page of a level book had been damaged so that the readings marked ✗ are missing. Find the missing readings with the help of available readings and apply arithmetical check. **(18)**

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Contd ... Q. No. 4 (a)

Distance in m	B.S.	I.S.	F.S.	H.I.	R.L.	Remarks
	×			×	209.510	B.M.
0		1.675			×	
30		×			210.425	
60		3.355			209.080	
×	0.840		×	209.520	×	C.P
120		×			208.275	
150		×			210.635	Underside of bridge girder
×	×		2.630	×	×	×
210		×			206.040	
240		1.920			205.895	
270			×		205.690	

(b) Derive the distance and elevation formula for inclined sights with staff remain vertical by using a tacheometer at an uneven ground, provided that the ground point has a vertical depression angle. **(14)**

(c) Reciprocal levels were taken with a dumpy level and following observations were recorded.

Instrument near	staff reading (in meter) at	
	A	B
A	1.40	2.52
B	1.33	0.524

R.L of A = 625.155 m and the distance between A and B is 1000 m. Find (i) True difference of level between the stations; (ii) combined correction for curvature and refraction. **(14⅔)**

SECTION – B

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

5. (a) Define (i) Serpentine Curve (ii) Easement Curve (iii) Cant (iv) Shift and (v) Versed Sine **(10)**

(b) What are the methods for ranging a circular curve? Describe the method "Ordinate from long chord". **(12)**

(c) What is vertical curve? Calculate the necessary data to set out a vertical curve which connects an upgrade of 0.6% with a downgrade −0.7%. The chainage and reduced level at the point of intersection are 2525 m and 335.65 m respectively. Assume the rate of change of grade 0.05% per chain of 20 m length. **(24⅔)**

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6. (a) Suppose you have to measure the depth of the Gorai River. The bed of this river is subjected to frequent scour and silting. How you will identify the location of soundings in this condition? **(12)**

(b) A propeller type current meter measures velocities of 0.62 m/s, 0.71 m/s and 0.89 m/s which correspond to 118, 136 and 172 revolutions respectively for each 30 sec. With the same device, measurements were carried out in a channel as shown in figure and the following data were obtained - **(20⅔)**
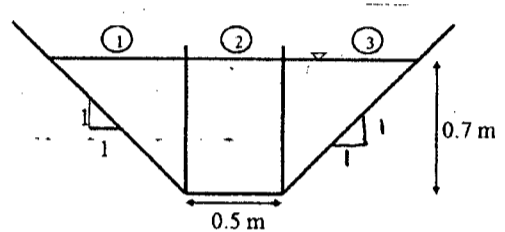
Location of Current Meter	Horizontal (From Left)	At middle of strip 1			At middle of strip 2			At middle of strip 3		
	Vertical (From Top)	At 0.2Y	At 0.6Y	At 0.8Y	At 0.2Y	At 0.6Y	At 0.8Y	At 0.2Y	At 0.6Y	At 0.8Y
Current Meter Reading	No of revolution (rev)	110	105	102	124	121	119	112	108	106
	Time of Observation (sec)	30	30	30	30	30	30	30	30	30

Calculate the mean velocity of the channel.

(c) The areas within the contour lines at the site of a reservoir and the face of the proposed dam are as follows:

Contour(m)	Area (m²)	Contour(m)	Area (m²)
101	1000	106	1350000
102	12800	107	1985000
103	95200	108	2286000
104	147600	109	2512000
105	872500		

Calculate the capacity of the reservoir. **(14)**

7. (a) Write short notes on (i) Ecliptic (ii) Mean Solar Time (iii) Solstices **(9)**

(b) Give the names of different systems of astronomical co-ordinates. Describe the independent equatorial system. **(10)**

(c) Calculate the time at Sylhet, Bangladesh (Longitude 91°52'20"E) when it is 6:30 A.M. at Los Angels, USA (Longitude 118°14'25"W). **(13)**

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(d) An observation was made on March 15, 2014, on the sun using the upper limb and the reading was 41°4'6.24" with face-left. The semi-diameter of the sun at the time of observation was 15'54". The face-left and face right observations of the theodolite on the top of a flag-mast were 5°4'20" and 5°6'40" respectively. Determine the true altitude of the sun. **(14⅔)**

8. (a) Define the following terms : (i) Exposure Station (ii) Drift (iii) Stereoscopy (iv) Control Points **(8)**

(b) Photographs of a certain area were taken from P and Q, two camera stations, 100 m apart. The focal length of the camera is 150 mm. The axis of the camera makes an angle of 60°and 40° with the base line at stations P and Q respectively. The image of point A appears 20.2 mm to the right and 16.4 mm above the hair lines on the photograph taken at P and 35.2 mm to the left on the photograph taken at Q. Calculate the distance PA and QA and elevation of point A, if the elevation of the instrument axis at P is 126.845 m. **(14)**

(c) An area 30 km long in the north-south direction and 24 km in the east-west direction is to be photographed with a lens having 30 cm focal length for the purpose of compiling a topographic map. The size of the photograph is 20 cm × 20 cm. The average scale is to be 1 : 12000 effective at an average elevation of 400 m above datum. Overlap is to be at least 60% and sidelap is to be at least 30%. The ground speed of the aircraft will be maintained at 200 km/hr. The flight lines are laid in a east-west direction on an existing map having a scale of 1 : 60000. The two outer flight lines are to be coincided with north-south boundaries of the area. Determine the data for the flight lines. **(24⅔)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-1/T-2   B. Sc. Engineering Examinations 2012-2013
Sub : MATH 133 (Matrices and Co-ordinate Geometry)
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.
Symbols have their usual meaning.

1. (a) Show that inverse of a non-singular matrix is unique.   **(5)**

   (b) Reduce $A = \begin{bmatrix} 1 & -2 & 1 & 3 \\ 4 & -1 & 5 & 8 \\ 2 & 3 & 3 & 2 \end{bmatrix}$ to the normal form B and compute the matrices P and Q

   such-that PAQ = B, where A and B are equivalent matrices.   **(20)**

   (c) Given $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 3 & 2 \\ 1 & 5 & 4 \end{bmatrix}$, find A^{-1} by algebraic method.   **(10)**

2. (a) Determine the values of α, β, γ when the matrix $\begin{bmatrix} 0 & 2\beta & \gamma \\ \alpha & \beta & -\gamma \\ \alpha & -\beta & \gamma \end{bmatrix}$ is orthogonal.   **(10)**

   (b) Find the matrix A satisfying the following matrix equation
   $$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} -2 & 4 \\ 3 & -1 \end{bmatrix}.$$ **(15)**

   (c) Find for what values of k, the set of equations:
   $$2x - 3y + 6z - 5t = 3, \quad y - 4z + t = 1, \quad 4x - 5y + 8z - 9t = k \text{ has}$$
   (i) no solution (ii) infinite number of solutions.   **(10)**

3. (a) Test the dependency of the following sets of vectors   **(18)**
   $$\text{(i) } \{(1, 2, -3), (2, 0, -1), (7, 6, -11)\}$$
   $$\text{(i) } \{(2, 0, -1), (1, 1, 0), (0, -1, 1)\}$$

   (b) Find the minimal polynomial $m(\lambda)$ of the matrix $A = \begin{bmatrix} 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 5 \end{bmatrix}$.   **(17)**

MATH 133(WRE)

4 (a) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$. Also find

the matrix P that diagonalizes A and determine $P^{-1}AP$. **(18)**

(b) State and prove Cayley-Hamilton theorem and verify it for the matrix:

$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. **(17)**

SECTION – B

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

5. (a) Find the locus of a point P which moves so that its distances from the points $A(-2, 2, 3)$ and $B(13, -3, 13)$ are governed by the relation $3PA = 2PB$. **(17)**

(b) Find the direction cosines of two lines which are connected by the relations $\ell - 5m + 3n = 0$ and $7\ell^2 + 5m^2 - 3n^2 = 0$. Also find the angle between the lines. **(18)**

6. (a) Test whether the four points $(0, -1, -1)$, $(4, 5, 1)$ $(3, 9, 4)$ and $(-4, 4, 4)$ are coplanar or not. If they are coplanar find the equation of the common plane. **(17)**

(b) The planes $3x - 7y - 5z = 1$ and $5x - 13y + 3z + 2 = 0$ cut the plane $8x - 11y + 2z = 0$ to make two straight lines. Find the angle between the lines. **(18)**

7. (a) Show that the lines $\dfrac{x-a}{a'} = \dfrac{y-b}{b'} = \dfrac{z-c}{c'}$ and $\dfrac{x-a'}{a} = \dfrac{y-b'}{b} = \dfrac{z-c'}{c}$ intersect and

find the coordinates of the point of intersection and the equation of the plane in which they lie. **(17)**

(b) Find the length and equation of the shortest distance between the two lines.

$$\frac{x+3}{-4} = \frac{y-6}{3} = \frac{z}{2} \text{ and } \frac{x+2}{-4} = \frac{y}{1} = \frac{z-7}{1}.$$

Also find the points of intersections. **(18)**

8. (a) 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. **(17)**

(b) Find the equations to the planes which contain the line given by $7x + 10y - 30 = 0$, $5y - 3z = 0$ and touch the ellipsoid $7x^2 + 5y^2 + 3z^2 = 60$. **(18)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 _ B. Sc. Engineering Examinations 2012-2013

Sub : **HUM 113** (Economics)

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** questions.

1. (a) What are the equilibrium conditions in case of a firm in a monopoly market? Show graphically the 'super normal profit', 'abnormal loss, and 'normal profit for a firm in perfect competition.   **(10⅓)**

    (b) Consider an arbitrary cost function of a firm: **(13)**

    $TC = 7Q^3 - 126 Q^2 + 5250 Q$, where TC = Total Cost

    With the help of the above cost equation, derive the marginal cost and average cost curves from the total cost curve and then show the relationship between total cost, marginal cost and average cost curves.

2. (a) Suppose the production equation of a firm is $TP = - 4L^3 + 360 L^2$.

    Sketch a graph showing the relationship between the total product, average product ad marginal product curves of the firm.   **(12)**

    (b) Define 'returns to scale? Explain different types of 'returns to scale'.   **(5⅓)**

    (c) What is Production Possibility Frontier (PPF)? What will be the impact of the changes in technology and resources on the PPF? Compare the PPF of a rich country and that of a poor country.   **(6)**

3. (a) What is inflation? What are the causes of demand pull and cost push inflation?   **(5+8=13)**

    (b) Compare graphically the effects of demand pull and cost push inflation on an economy? What do you mean by stagflation?   **(10⅓)**

4. (a) Write short notes on Gross Domestic Product (GDP) and Gross National Product (GNP).   **(8)**

    (b) What are the methods to measure GDP? What items are not considered in GDP calculation?   **(15⅓)**

HUM 113(WRE)

SECTION – B

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

5. (a) What is meant by the concepts of microeconomics and macroeconomics. Briefly discuss the relative importance of microeconomics and macroeconomics in the formation of national economic policies of a country. **(8)**

(b) What is meant by 'change in demand' and 'change in quantity demanded'? Describe the following situations of demand curve: **(7⅓)**

    (i) Movement along the same demand curve

    (ii) shift of the demand curve.

(c) Mathematically derive the cardinal theory of consumer equilibrium both for independent and interdependent commodities. **(8)**

6. (a) Narrate the factors that affect the demand for a commodity. **(6)**

(b) Why does demand curve slope down words to the right? **(3⅓)**

(c) Define market equilibrium. Discuss how the price of a commodity in the market is determined. **(7)**

(d) Calculate the equilibrium price and quantity from the following market demand function and market supply function and graphically show the results. **(7)**

$$QD_x = 1500 - 30\,P_x$$

$$QS_x = -500 + 50\,P_x$$

7. (a) Discuss in detail the following concepts: **(8⅓)**

    (i) Cross elasticity of demand

    (ii) Income elasticity of demand

(b) Explain how the state of technology affects the supply of a commodity. **(5)**

(c) Discuss the concept of marginal rate of substitution. **(5)**

(d) What is meant by budget constraint line? Explain graphically. **(5)**

8. (a) Define an indifference curve. Explain how you would construct an indifference curve. **(5)**

(b) What do you understand by substitution effect and income effect of a price change? **(5)**

(c) Derive a demand curve with the help of indifference curves and budget lines and show that price effect is equal to substitution effect and income effect. Present and explain all necessary diagrams. **(13⅓)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2   B. Sc. Engineering Examinations 2012-2013

Sub : **EEE 165** (Basic Electrical Technology)

Full Marks : 210   Time : 3 Hours

The questions are of equal value.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

1. (a) Why sinusoidal alternating current is popular for commercial utilization?

   (b) For sinusoidal alternating wave form define the following:

   Instantaneous value; Peak value; Period and cycle with appropriate diagram.

   (c) Given ω = 260 rad/s, determine how long it will take the sinusoidal wave form to pass an angle π.

   (d) What is the phase difference between the sinusoidal wave forms of each of the following sets?

   (i) $i = 2 \cos (\omega t + 20°)$; $v = 2 \sin (\omega t - 25°)$

   (ii) $i = 15 \sin (\omega t + 30°)$; $v = 10 \sin (\omega t + 30°)$

2. (a) Define Capacitive Reactance of a capacitor and Inductive Reactance of an inductor.

   (b) Determine the input impedance to the series network of Fig. 2(b). Draw the impedance diagram (vector representation)

Fig 2(b)
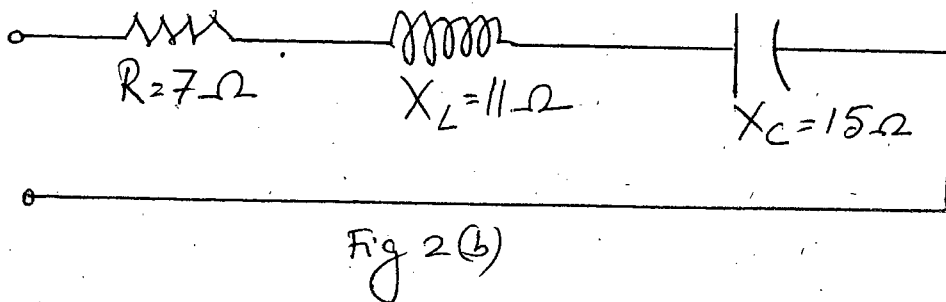
   (c) Using voltage divider rule, find the voltage across each element of the circuit of Fig. 2(c).

Fig. 2(c)
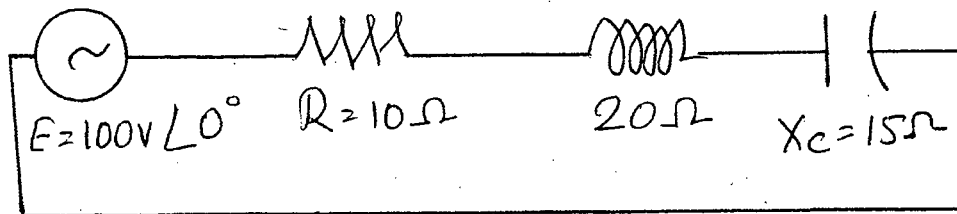
   (d) Using the current divider rule, find the current through each impedance of Fig. 2(d).

Fig 2(d)
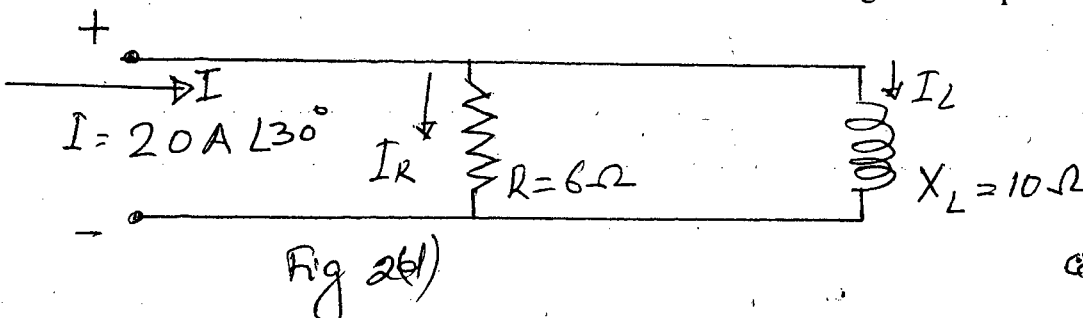
3. (a) Draw the power triangle of the circuit of Fig. 3(a).

Fig. 3(a)

$E = 200V \angle 0°$ $X_L = 5\,\Omega$ $R = 10\,\Omega$ $X_c = 15\,\Omega$
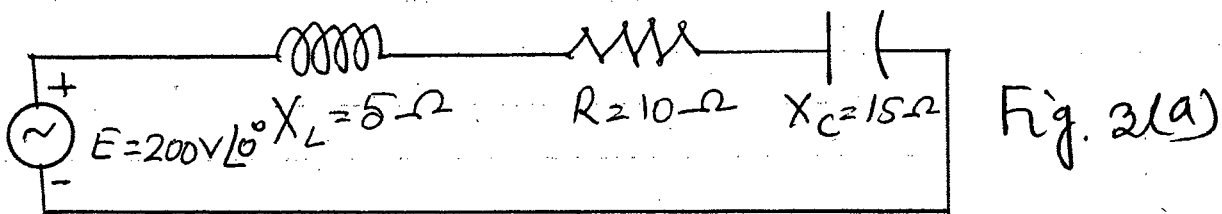
(b) Find the total power, Volt-ampers reactive, Volt-ampers and Power Factor (FP) of the network shown in Fig. 3(b).

Fig. 3(b)

$E = 100V \angle 0°$

300 W
15 VAR (ind)

700 VAR (cap)
500 W

1800 W
500 VAR (ind)
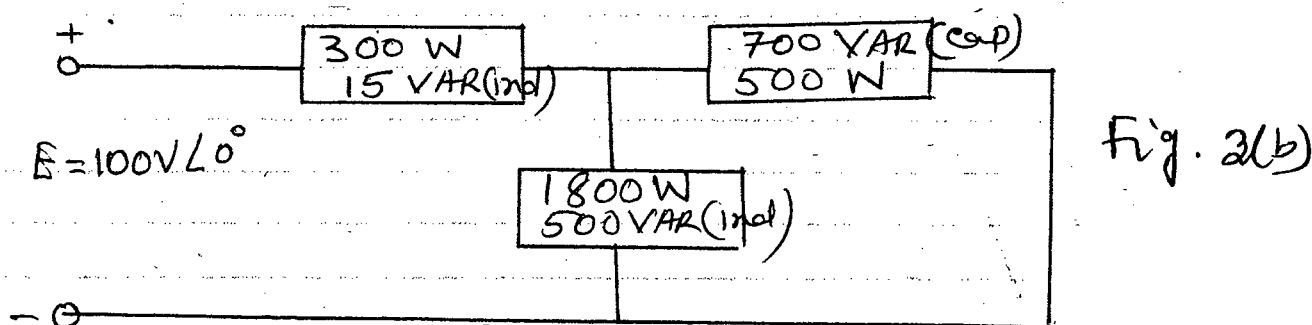
(c) For the three-wire system shown in Fig. 3(c), sketch three different ways that two wattmeters can measure the total Power delivered.

Fig. 3(c)

A

B

C

Δ or Y
Connected
Load

Fig. 3(c)
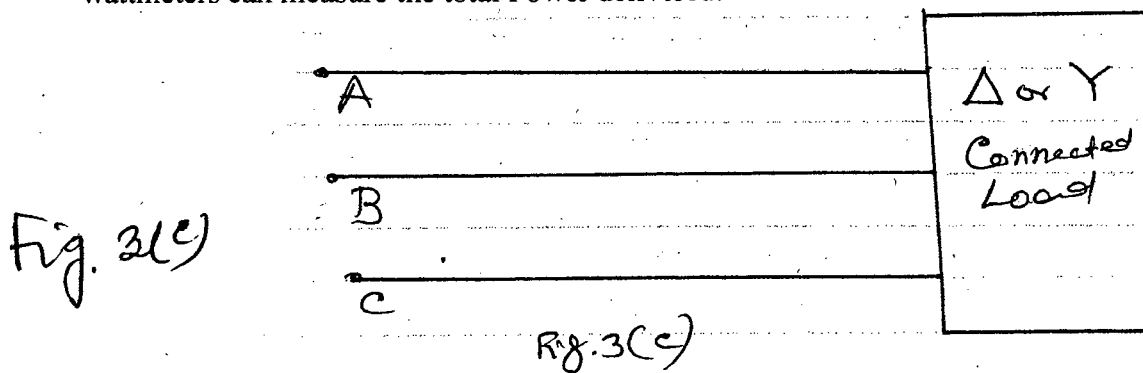
4. Determine the total power, Volt-ampers reactive and Volt-ampers for the network shown in Fig. 4.

Fig. 4

$E_L = 220V \angle 0°$

$E_L = 220V \angle 120°$

$E_L = 220V \angle -120°$
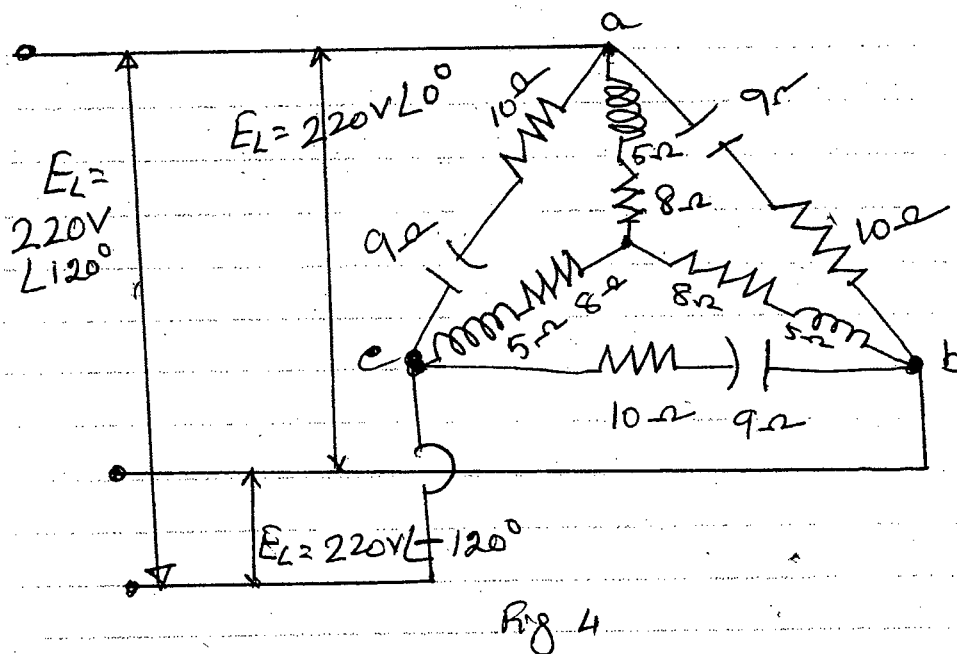
EEE 165(WRE)

SECTION – B

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

5. (a) Find I and Vs in the circuit shown in Fig. 5(a).

   (b) Find R if Req = 50 Ω in the circuit in Fig. 5(b).
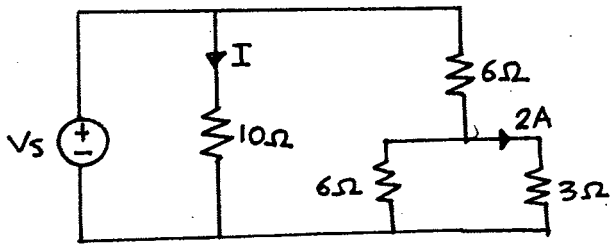
Fig. 5(a)
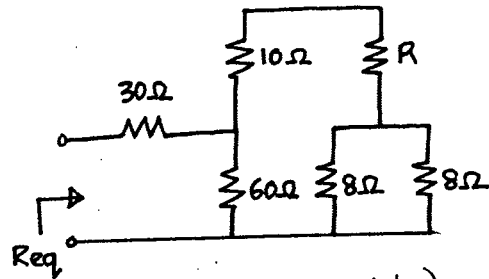
Fig. 5(b)

6. (a) Use mesh analysis to obtain i_0 in the circuit of Fig. 6(a).

   (b) Determine node voltages using nodal analysis and find the power absorbed by the 8 Ω resistance in the circuit of Figure 6(b).
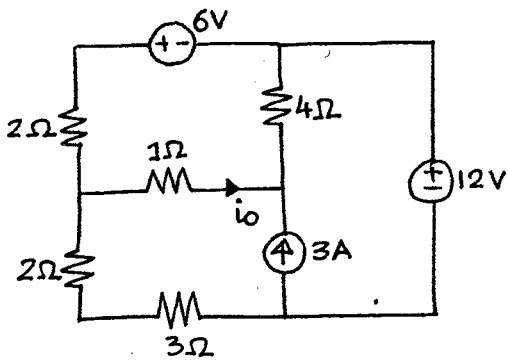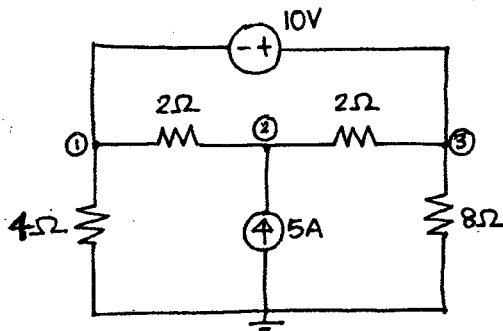
Figure 6(a)

Figure 6(b)

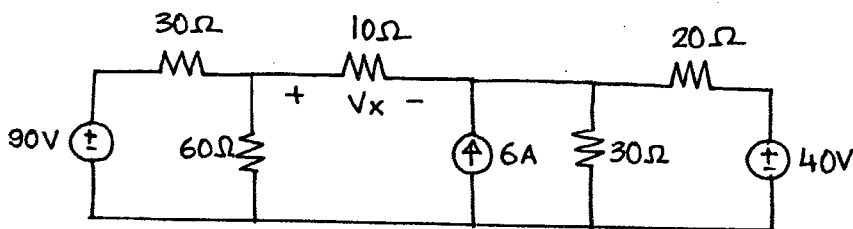7. (a) Use source transformation to obtain Vx in the circuit of Fig. 7(a).

Figure 7(a)

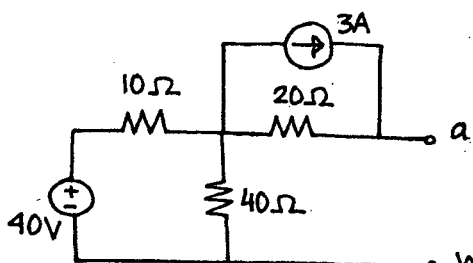   (b) Find Norton's equivalent circuit at terminals a-b of circuit shown in Fig. 7(b).

Figure 7(b)

EEE 165(WRE)

8. (a) In the circuit of Fig. 8(a), what resistor value R_L should be connected across terminals a-b to absorb maximum power from the circuit?
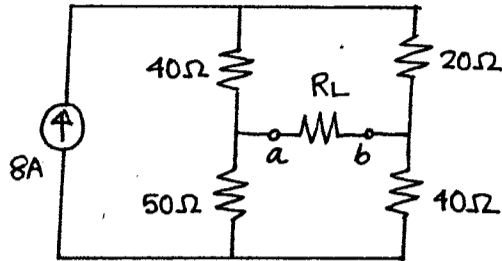

Figure 8(a)

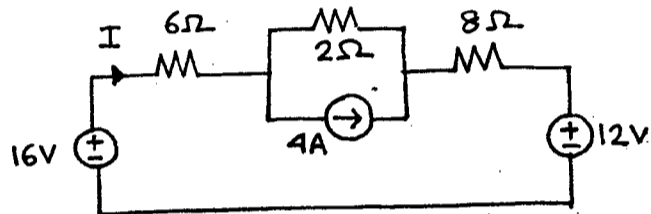(b) Use superposition principle to find I in the circuit of Fig. 8(b).

Figure 8(b)

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2   B. Sc. Engineering Examinations 2012-2013

Sub : **PHY 153** (Structure of Matter, Electricity and Magnetism and Modern Physics)

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 (i) Translation vector, (ii) Lattice parameters in case of crystals. **(6)**

   (b) Describe cubic crystal system with their space lattices on the basis of their characteristics. **(12)**

   (c) Describe NaCl structure, why the packing factor of NaCl is less than that of a standard face centered cubic crystal? **(12)**

   (d) Molybdenum has body centered cubic type of crystal structure with the lattice constant $3.15 \overset{\circ}{A}$ and atomic weight 95.94. Calculate the theoretical density of Molybdenum crystal. **(5)**

2. (a) Write all the crystal directions from the family <100> and <111>. **(4)**

   (b) For a crystal system in which the crystallographic axes are mutually orthogonal to each other, find the relation between interplanar spacing and Miller indices. **(16)**

   (c) Show that the ratio $d_{100} : d_{110} : d_{111}$ of a simple cubic lattice is not the same as that of a face centered cubic lattice. **(10)**

   (d) Find the Miller indices of a plane in a crystal which is parallel to Y - axis and cuts the intercepts 3a and 5c in X and Z-axes, respectively. Draw the plane obtained from the above information. **(5)**

3. (a) Distinguish between ionic bond and covalent bond. **(6)**

   (b) Define cohesive energy. Find the cohesive energy of a NaCl crystal. **(15)**

   (c) Write short notes on : **(9)**
      (i) Interstitial defect,
      (ii) Grain Boundary defect,
      (iii) n-type semiconductor.

   (d) X-rays of wavelength $1.47 \overset{\circ}{A}$ are incident on the first (111) plane of a cubic crystal where the Bragg's angle of reflection is 13.4°. Find the interplanar spacing between the mentioned planes and lattice constant of the crystal. **(5)**

PHY 153(WRE)

4. (a) An electric dipole is placed in a uniform external electric field E. Calculate (i) the torque exerted on the dipole by the electric field and (ii) the work done for changing the orientation of the electric dipole in that field. **(10)**

(b) State Gauss's law and apply it to obtain an expression for the electric field strength at a point (i) inside (ii) outside and (iii) surface of a uniformly charged spherical shell. **(17)**

(c) Two point charges 2×10^{-7} C and 8.5×10^{-7} C are 12 cm apart. What electric field is produced by each at the side of the other and what force acts on each? **(8)**

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

5. (a) What is energy density for a capacitor? Calculate the capacitance of a spherical capacitor of radii and a and b. **(12)**

(b) Derive the equation $Q = Q_0 (1 - e^{-t/RC})$ for charging a RC Circuit where the terms have their usual meanings. Find also the expression for the current during charging of a capacitor. Does the charging depend on the value of the time constant? **(17)**

(c) An air capacitor of capacitance 0.004 µF is connected to a battery of 300 V. It is then disconnected to the power supply and is immersed in an insulating oil having relative permittivity of 2.5. Find the energy stored in the capacitor before and after immersion. **(6)**

6. (a) State and explain Biot-Savart law. Find out the force between two parallel current carrying conductors. Under what condition the force becomes attractive or repulsive? **(17)**

(b) Using Ampere's law, calculate the magnetic field at the centre of a toriod. **(10)**

(c) An electron of energy 2000 eV describes a circular path in a magnetic field of flux density 0.2 T. What is the radius of the path? Given that, charge of electron = 1.6×10^{-19} C mass of electron = 9×10^{-31} kg. **(8)**

7. (a) Define followings: (i) Photoelectric effect. (ii) Stopping potential (iii) Threshold frequency. **(10)**

(b) Show that the relativistic energy for all particles is, $E = \sqrt{m_0^2 C^4 + p^2 c^2}$ and the energy of a mass-less particle is, E = PC. Symbols have their usual meanings. **(15)**

(c) Two electrons leave radioactive sample in same directions, having speeds of 0.6c and 0.8c with respect to the sample. What is the speed of slow electron relative to the fast electron? Explain the result. **(10)**

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8. (a) Obtain an expression for Compton wavelength shift of a photon undergoing Compton scattering. **(18)**

(b) Write down the Bohr's Postulates about atomic structure. **(9)**

(c) Estimate the age of earth from the relative abundance of the two isotopes of uranium, U^{235} and U^{238}. Given that the half life of $U^{235} = 7.07 \times 10^8$ Years and half life of $U^{238} = 4.5 \times 10^9$ Years. **(8)**