BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2   B. Sc. Engineering Examinations 2014-2015

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**.

1. (a) Give a definition sketch of a simple circular curve and define all related notations and parameters. **(10⅔)**

    (b) Two straight alignments of a proposed road intersect at chainage (58 + 34) the angle of intersection being 137°30′. It is proposed to insert a circular curve in between alignments. Calculate the necessary data to set out circular curve with a radius of 300 m by drawing radial offset from tangents. The chain is 20 m long. **(9)**

    (c) What is transition curve? Show that the equation of transition curve is identical to the equation of cubic parabola. **(12)**

    (d) A parabolic vertical curve is to be set out connecting two uniform grades of − 1.0% and + 0.5%. The chainage and reduced level of point of intersection is 1775 m and 328.85 m respectively. The rate of change of grade is 0.15% per chain of 20 m. Calculate the necessary data to set out a vertical curve. **(15)**

2. (a) What is hydrographic surveying? Write the use of hydrographic surveying. **(8)**

    (b) In a harbour development scheme at the mouth of a tidal river, it has been found necessary to take soundings. Explain briefly how would you fix the positions of the soundings. **(10⅔)**

    (c) The following data are obtained in a stream-gauging operation. Calculate the discharge and mean velocity for the entire section from section from the data given below. **(17)**

Distance from the left water edge (m)	0	1.5	3.0	4.5	6.0	7.5	9.0	11.0
Total Depth, d (m)	0	1.3	2	2.5	1.7	1.0	0.8	0
Velocity at 0.2 d (m/s)	0	0.6	0.8	1.1	0.8	0.6	0.4	0
Velocity at 0.8 d (m/s)	0	0.5	0.72	1.0	0.75	0.45	0.3	0

    (d) The areas within the contour lines at the site of a reservoir and the face of the proposed dam are as follows: **(11)**

Contour (m)	Area (m²)	Contour (m)	Area (m²)
101	1000	104	147600
102	12800	105	872500
103	95200	106	1350000

Calculate the capacity of the reservoir using prismoidal rule.

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3. (a) Why area and volume calculation is important in surveying? Derive the formula for calculating the area of a two level section. **(3+12=15)**

(b) Write short notes on (i) Solstices (ii) The Independent Equatorial System (iii) Mean Solar Time **(3×3=9)**

(c) An observation was made on November, 2015, on the Sun using the upper limb and the reading was 32°8′4.8″ with face right. The semi-diameter of the Sun at the time of observation was 15′59.35″. The face left and face right observations of the theodolite on the top of the flag-mast were 5°36′48″ and 5°35′26″ respectively. Determine the true altitude of Sun. **(14⅔)**

(d) Calculate the time at Chittagong, Bangladesh (Longitude 91°48′44″E) when the Greenwich Mean Time (G.M.T.) is 9:30 P.M. on December 23,2015. **(8)**

4. (a) Describe the fundamental principle of plotting an object in photogrammetry. **(12⅔)**

(b) An aerial camera having a focal length of 24 cm is used to take vertical photograph of a terrain with a tower. This tower is lying on a flat area having an average elevation of 800 m above mean sea level. A line AB, 200 m long on the ground, measures 12.2 m on the same photograph. At what altitude an aircraft must fly in order to get the photograph with tower maintaining this scale. **(10)**

(c) An area 50 km long in the north-south direction and 100 km in the east-west direction is to be photographed with a lens having 21 cm focal length for the purpose of compiling a topographic map. The size of the aerial photograph is 18 cm × 18 cm. The average scale is to be 1:20000 effective at an average elevation of 400 m above datum. Overlap is to be at least 60% and sidelap is to be at least 20%. The ground speed of the aircraft will be maintained at 296 km/hr. The flight lines are laid in a east-west direction on an existing map. The two outer flight lines are to be coincide with north-south boundaries of the area. Determine the data for flight plan. **(24)**

SECTION – B

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

5. (a) Define surveying. What are the purposes to carry out surveying? **(6)**

(b) Write short note with suitable figure : (i) Field Book; (ii) Ranging Rod; (iii) Arrows **(3×4=12)**

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Contd ... Q. No. 5

(c) From a common point A, traverses are conducted on either side of a harbor as follows: **(15)**

Traverse	Line	Length (m)	W.C.B.
1	AB	240	$85^\circ 26'$
	BC	120	$125^\circ 11'$
2	AD	270	$175^\circ 50'$
	DE	600	$85^\circ 07'$

(i) Draw the combined closed traverse ABCFDA, where CD intercepts DE at point F. Also calculate (ii) distance from C to point F on DE due south of C and (iii) distance EF.

(d) Describe the methods of locating contours. **($13\frac{2}{3}$)**

6. (a) Following reading were obtained from an instrument station B using anallatic Tachometer having k = 100. **(18)**

Instrument at	H.I	To	Bearing	Vertical angle	Stadia Readings
B	1.503 m	A	$69^\circ 30'$	$+5^\circ$	0.658, 1.055, 1.451
		C	$159^\circ 30'$	0°	2.231, 2.847, 3.463

The staff was held vertical for both observations. Bore holes were sunk at A, B, C to expose a plane bed of rock, the ground surface being respectively 11.918 m, 10. 266 m, 5.624 m above the rock plane. Given the R.L. of B was 36.582 m. Determine the gradient of rock along AB.

The Following reading have been taken from a page of old reading book. It is required to reconstruct the page. Fill up the missing quantities marked as x and apply the usual checks. **(18)**

Point	B.S.	I.S.	F.S.	Rise	Fall	R.L.	Remarks
1	3.125					x	B.M.
2	x		x	1.325		125.505	T.P.
3		2.320			0.055		
4		x				125.850	
5	x		2.655				T.P.
6	1.620		3.205		2.165		T.P.
7		3.625					
8			x			123.090	T.B.M

(c) What is remote sensing? What are the kinds of remote sensing? Explain. Write down some applications of GPS system. **($10\frac{2}{3}$)**

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7. (a) In a proposed hydrostatic project a storage reservoir required to provide a storage of 4.5 Mm³ between lowest drawdown (L.D.D) and top water level (T.W.L). The areas contained within the stated contours a upstream face of the dam were as follows: **(18)**

Contours	100	95	90	85	80	75	70	65
Area (ha)	30	25	23	17	15	13	7	2

If L.D.D was to be 68 m calculate the T.W.L for 60% of full storage capacity.

(b) At noon, the Sun remains exactly on geographical meridian. Find the magnetic declination at a place if magnetic bearing of the Sun at noon is 184°. **(5)**

(c) What is the objective of tachometric surveying? What are the errors in tachometry? **(10⅔)**

(d) A steel tape of 20 m long standardized at 55° F with a pull of 10 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 pull exerted was 16 kg. Weight of 1 cubic cm of steel = 7.86 g, weight of tape = 0.8 kg and E = 2.109 × 10⁶ kg/cm², α = 6.2 × 10⁻⁶. **(13)**

8. (a) Determine the height of a pole above the ground on the basis of following angles of elevation from two instrument stations A and B, in line with the pole. **(14⅔)**

   Angles of elevation from A to top and bottom of pole: 30° and 25°

   Angles of elevation from B to top and bottom of pole: 35° and 29°

   Horizontal distances AB = 30 m

The readings obtained on the staff at the B.M. with the two instrument settings are 1.48 and 1.32 m respectively. What is the horizontal distance of the pole from A?

(b) A Theodolite was set up at a distance of 200 m from a tower, the angle of elevations to the top of the parapet was 8°18′ while the angle of depression to the foot of the wall was 2°24′. The staff reading on the B.M. of R.L. 248.362 m with the telescope horizontal was 1.286 m. Find the height of the tower and R.L. of the top of the parapet. **(13)**

(c) What are the special compasses? Write down names of six special instruments. **(5+6=11)**

(d) What are curvature and refraction correction? Why they are necessary in levelling? **(8)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2   B. Sc. Engineering Examinations 2014-2015

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 the flux of an electric field.   **(4)**

     (b) State and explain Gauss's law in electrostatics. What is a Gaussian surface? Give its importance.   **(8)**

     (c) Derive an expression for the electric field intensity due to an infinitely long, straight wire of linear charge density, λ cm^{-1}.   **(15)**

     (d) A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of 80.0 μC/m^2. (i) Find the charge on the sphere. (ii) What is the total electric flux leaving the surface of the sphere?   **(8)**

2. (a) What are polar and non-polar dielectrics?   **(6)**

     (b) Show that the capacitance of a parallel plate capacitor with a compound dielectric is

$C = \dfrac{K\varepsilon_0 A}{t + K(d-t)}$ where K is the dielectric constant of the slab, ε_0 is the permitivity of air,

t is the thickness of the slab and d is the separation between the plates.   **(20)**

     (c) A parallel plate capacitor has a capacitance of 100 PF with plate area of 100 cm^2 and a mica dielectric of dielectric constant 5.4. At 50 volts potential difference between the capacitor plates, calculate (i) the free charge on the plates (ii) Electric field strength in the mica and (iii) the induced surface charge.   **(9)**

3. (a) Explain the terms self-inductance and mutual inductance.   **(7)**

     (b) Write down the differential equation for a series L-R circuit. Derive an expression for the growth of current when a source of constant e.m.f. is connected to an L-R circuit in series. What is meant by the time constant of the circuit?   **(22)**

     (c) A current of 10 A flows through a conductor of cross-section 1 mm^2. If density of the charge carrier be 10^{21} cm^{-3}, calculate the drift velocity of the electrons. Charge on an electron = 1.6×10^{-19}C.   **(6)**

4. (a) Show that two events appear simultaneous to an observer 'A' will not be simultaneous to another observer 'B' which is moving with respect to A.   **(12)**

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Contd ... Q. No. 4

(b) Derive an expression for the relativistic addition of velocities. **(13)**

(c) A muon has a lifetime of 2×10^{-6} s in its rest frame. It is created 50 km above the earth moves forward it at a speed of 2.97×10^8 m/s. At what altitude does it decay? According to the muon, how far did it travel in its life time? **(10)**

SECTION – B

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

5. (a) What are the failures of wave theory of light to explain photo electric effect? **(6)**

(b) Show that the wavelength of the scattered photon due to Compton effect is greater than the wavelength of the incident photon by $\dfrac{h}{m_o c}(1 - cos\,\theta)$, where the symbols have their usual meaning. **(20)**

(c) If the maximum kinetic energy of an electron in a Compton scattering experiment is 10 keV, what is the wavelength of the incident ray? **(9)**

6. (a) Describe briefly the shell model of the nucleus. **(12)**

(b) Show that the average life of the radioactive nucleus of a radioactive substance is proportional to the half life of that radioactive substance. **(14)**

(c) What proportion of ^{235}U and ^{238}U was present in a rock formed 3×10^9 years ago? Given that, the present proportion of ^{235}U to ^{238}U is 1 : 140 and half life of ^{235}U is 8.8×10^8 years and for ^{238}U is 4.5×10^9 years. **(9)**

7. (a) Describe NaCl crystal structure. How does it differ from a standard face centered cubic structure? **(13)**

(b) Define Miller indices. Write the procedure for finding Miller indices? **(12)**

(c) In an orthorhombic crystal (1 3 1) represents a set of parallel planes. Find the intercepts of the plane along the three crystallographic axes. (consider a = 1.21 Å, b = 2.17 Å and C = 1.72 Å) **(10)**

8. (a) Derive Bragg's law of X-ray diffraction. **(12)**

(b) What are the characteristic features of ionic bonding? Why ionic solids are brittle? **(8)**

(c) What is an intrinsic semiconductor? Explain with the help of band diagram how an intrinsic semiconductor converts into an n-type or p-type semiconductor. **(15)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-1/T-2 B. Sc. Engineering Examinations 2014-2015
Sub : **HUM 113** (Economics)

Full Marks : 140   Time : 3 Hours
The figures in the margin indicate full marks.
USE SEPARATE SCRIPTS FOR EACH SECTION

<u>SECTION – A</u>
There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) What is meant by production possibility frontier (PPF)? Explain how resources can be allocated in a society with the help of PPF.   **(13⅓)**

    (b) Illustrate the following application of PPF: **(10)**
       (i) Choice between necessities and luxuries.
       (ii) Choice between current consumption goods and investment.
       (iii) Choice between public goods and private goods.

2. (a) What are the assumptions of cardinal utility theory? Discuss.   **(5)**

    (b) Mathematically derive the cardinal theory of utility maximization.   **(10)**

    (c) Distinguish between the concepts of "Change in quantity demanded" and "change in demand". Explain graphically the above changes with reference to the change in prices of substitute and complementary commodities.   **(5)**

    (d) Discuss how the prices of other commodities affect the demand for a commodity.   **(3⅓)**

3. (a) Explain the concept of supply function.   **(3⅓)**

    (b) What are the factors that affect the supply of a commodity? Explain them. **(5)**

    (c) Calculate the equilibrium price and quantity from the following demand and supply functions.   **(10)**
    $$QD_x = 1200 - 5p_x$$
    $$QS_x = -500 + 12P_x$$
    What will happen to the equilibrium price and quantity if Government provides a subsidy of TK. 10 per unit? Graphically show the results. .

    (d) Define income elasticity of demand and write down its formula. Explain with a suitable example that a commodity may be luxury at 'low' levels of income, a necessity at 'intermediate' levels of income, and an inferior at 'high' levels of income.   **(5)**

4. (a) Explain the concept of cross elasticity of demand with suitable example. **(7)**

    (b) What is meant by budget constraint line? Explain.   **(6⅓)**

    (c) What do you understand by substitution effect and income effect of a price change? Derive a demand curve with the help of indifference curves and burdget lines and show that price effect is equal to substitution effect and income effect. Present and explain all necessary diagrams.   **(10)**

HUM 113

SECTION – B

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

Symbols indicate their usual meaning.

5. (a) Define production function. **(5)**

   (b) Clarify the concepts of short-run and long-run in the theory of production. **(5)**

   (c) Describe the relationship between total physical product (TPP), average physical product (APP) and marginal physical product (MPP). Use diagrams. **(13⅓)**

6. (a) What do you understand by revenue of a firm? Draw the average and marginal revenue curves of a firm facing a downward sloping demand curve. **(8⅓)**

   (b) What are the main features of a perfect competitive market? Explain the short run equilibrium of the firm under perfect competition. **(15)**

7. (a) What are the major macroeconomic policy objective that governments typically pursue? **(10)**

   (b) What is meant by aggregate demand (AD) in an economy? Illustrate the circular flow income model. **(13⅓)**

8. Write short notes on any THREE of the following: **(23⅓)**

   (i) Plant economies of scale of production

   (ii) Least-cost combination of factors of production

   (iii) Long run average cost (LRAC) curve of a firm

   (iv) Product method of measuring gross national product (GDP).

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2   B. Sc. Engineering Examinations 2014-2015

Sub : **MATH 133** (Matrices and Three dimensional 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**.

1. (a) If nonsingular symmetric matrices A and B commute, show that $A^{-1} B^{-1}$ is symmetric. **(5)**

(b) Find the adjoint of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & 1 \end{bmatrix}$ and hence find A^{-1}. **(10)**

(c) Find nonsingular matrices P and Q such that PAQ is in the normal form B,

where $A = \begin{bmatrix} 2 & 1 & -3 & -6 \\ 3 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$. **(20)**

2. (a) Solve the following system of linear equations by reducing the augmented matrix into its reduced row-echelon form: **(20)**

$$10y - 4z + w = 1$$
$$x + 4y - z + w = 2$$
$$3x + 2y + z + 2w = 5$$
$$-2x - 8y + 2z - 2w = -4$$

(b) Reduce the matrix A to canonical form and hence find the rank of A, where **(15)**

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

3. (a) Find all eigenvalues and corresponding eigenvectors of the matrix **(20)**

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

Also, find the matrix P that diagonalizes A and hence determine the diagonal matrix $P^{-1} AP$.

(b) Use Cayley-Hamilton theorem to find the inverse of the matrix A, where **(15)**

$$A = \begin{bmatrix} 1 & 2 & 2 \\ 3 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

4. (a) Examine whether the vectors $\underline{u} = (1, -3, 2)$, $\underline{v} = (2, -4, -1)$ and $\underline{w} = (3, 2, -1)$, are linearly dependent or independent. If possible, find a relation among them. **(7)**

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Contd ... Q. No. 4

(b) Find the nullity of the matrix $A = \begin{bmatrix} 1 & 1 & 2 & 4 \\ 1 & 2 & 2 & 5 \\ 1 & 3 & 2 & 6 \end{bmatrix}$. **(10)**

(c) Reduce the quadratic form $q = x_1^2 + 2x_2^2 + 3x_3^2 + 4x_1x_2 + 6x_1x_3 + 10x_2x_3$ to the canonical form and hence find rank, index and signature of q. **(18)**

SECTION – B

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

5. (a) If the edges of a rectangular parallelepiped are a, b, c. Show that the angles between the four diagonals are given by $cos^{-1}\left(\dfrac{\pm a^2 \pm b^2 \pm c^2}{a^2 + b^2 + c^2} \right)$ **(17)**

(b) Find the angle between the two lines whose direction cosines are given by the equations $l + m + n = 0$, $l^2 + m^2 - n^2 = 0$. **(18)**

6. (a) Find the equation of the straight line that intersects the lines
$4x + y - 10 = 0 = y + 2z + 6$, $\quad 3x - 4y + 5z + 5 = 0 = x + 2y - 4z + 7$
and passes through the point $(-1, 2, 2)$. **(17)**

(b) Find the magnitude and the equation of the line of shortest distance between the lines $\dfrac{x-3}{2} = \dfrac{y+15}{-7} = \dfrac{z-9}{5}$ and $\dfrac{x+1}{2} = \dfrac{y-1}{1} = \dfrac{z-9}{-3}$. **(18)**

7. (a) Find the equation of the plane through the intersection of the planes $x - 2y + z - 6 = 0$ and $2x + y - 2z - 3 = 0$, which is also perpendicular to $3x + 4y - 3z - 5 = 0$. **(17)**

(b) The axes are rectangular and a point P moves on the fixed plane $\dfrac{x}{a} + \dfrac{y}{b} + \dfrac{z}{c} = 1$. The plane through P perpendicular to OP meets the axes in A, B, C. The planes through A, B, C parallel to YOZ, ZOX, XOY intersect in Q. Show that the locus of Q is $\dfrac{1}{x^2} + \dfrac{1}{y^2} + \dfrac{1}{z^2} = \dfrac{1}{ax} + \dfrac{1}{by} + \dfrac{1}{cz}$. **(18)**

8. (a) Find the equation of the sphere for which the circle $x^2 + y^2 + z^2 + 7y - 2z + 2 = 0$, $2x + 3y + 4z - 8 = 0$ is a great circle. **(17)**

(b) Find the equation of the tangent plane to $2x^2 - 6y^2 + 3z^2 = 5$ which passes through the line $x + 9y - 3z = 0$, $3x - 3y + 6z - 5 = 0$. **(18)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2014-2015

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

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) Draw the AC wave shapes of v_1 and v_2. What is the phase difference between them? Which signal is leading?   **(7)**

   Here, $v_1 = -10 \sin(\omega t + 30°)$

           $v_2 = 20 \cos(\omega t + 10°)$, $\omega = 314$ rad/s

   (b) Calculate v_0 in the circuit in Fig.. for Q. No. 1(b). Also, draw the complete phasor diagram.   **(8)**
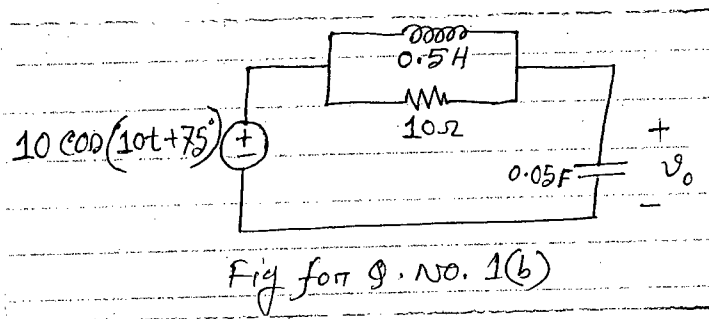
Fig for Q. No. 1(b)

   (c) Obtain the Thevenin's equivalent circuit between terminals a-b of the circuit shown in Fig. for. Q. No. 1(c).   **(20)**
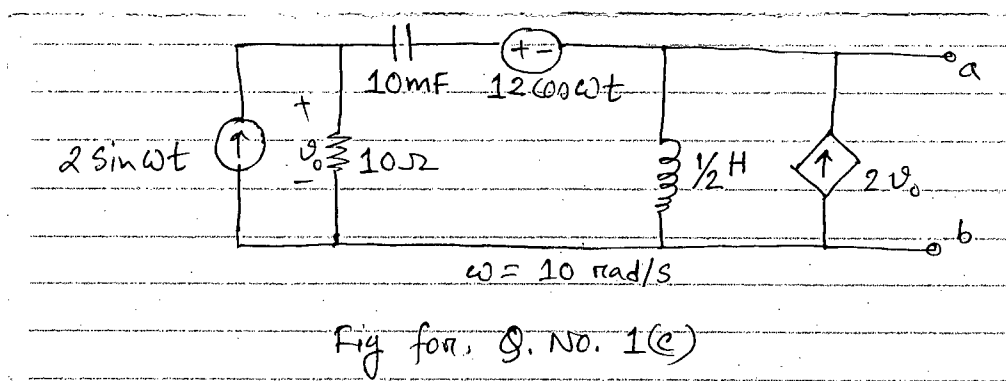
Fig for Q. No. 1(c)

2. (a) Find Vs in the Fig. for Q. No. 2(a). Given, $I_0 = 2\angle 0°$A.   **(15)**
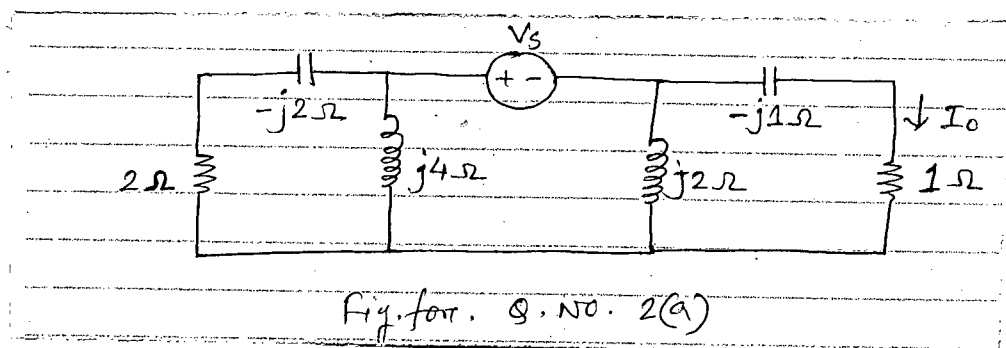
Fig. for Q. No. 2(a)

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Contd ... Q. No. 2

(b) Determine i_0 in the Fig for Q. No. 2(b)   **(20)**
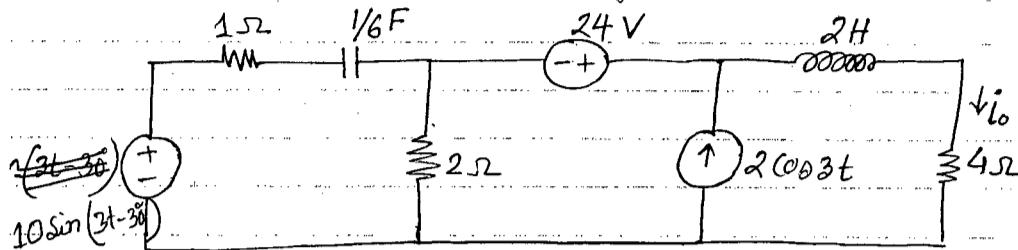
Fig for. Q. No. 2(b)

3. (a) Calculate the rms and average value of the current wave shown in Fig. for Q. No. 3(a)   **(15)**
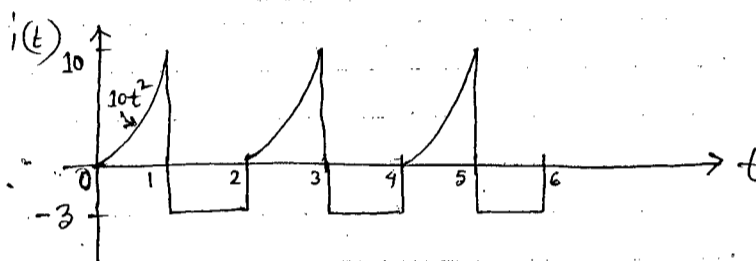
Fig for Q. No. 3(a)

(b) Calculate the average, reactive and complex power delivered by the dependent voltage source in the Fig. for Q. No. 3(b). What is the power factor of the circuit seen by the independent source? How much real power the independent source is supplying?   **(20)**
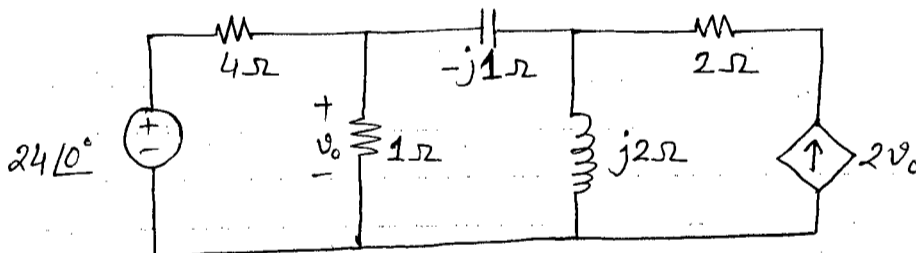
Fig. for. Q.No. 3(b).

4. (a) A balanced Δ-source is driving a balanced Δ-load. If impedance per phase of the load is 20-j15 Ω and V_{ab} = 330∠0°, calculate phase currents of the load and the line currents. Assume, *abc* sequence. (Fig. for Q. No. 4(a))   **(15)**

$Z_\Delta = 20 - j15\,\Omega$

Fig. for. Q. No. 4(a)

/3
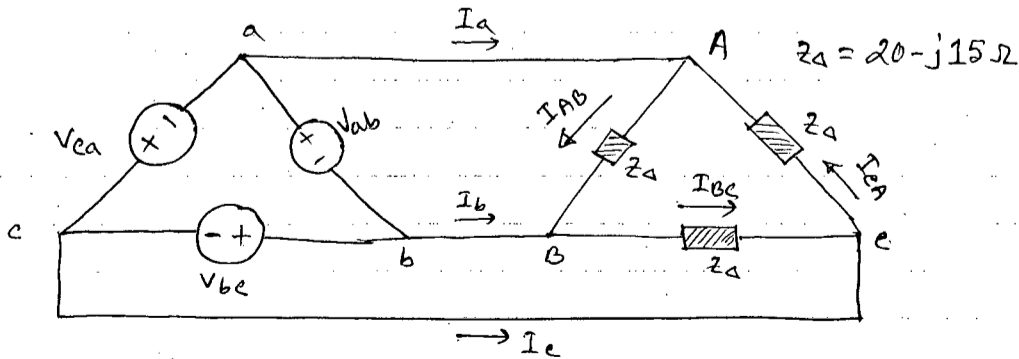
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Contd ... Q. No. 4

(b) A 20 kVA 8000/480 V transformer has the following parameters: **(20)**

$$R_p = 30\,\Omega \qquad\qquad R_s = 0.05\,\Omega$$
$$X_p = 40\,\Omega \qquad\qquad X_s = 0.06\,\Omega$$

Ref. to primary $R_{hfe}= 200\,k\,\Omega$, $X_M = 30\,k\,\Omega$.

Calculate: -

(i) Efficiency of the transformer

(ii) Voltage regulation of the transformer assuming rated unity pf load (i.e. pf = 1)

All symbols represent usual meaning.

SECTION – B

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

5. (a) Calculate V_0, I_0 and the power dissipated in the 25 Ω resistor in the circuit shown in Figure 5(a) **(17)**
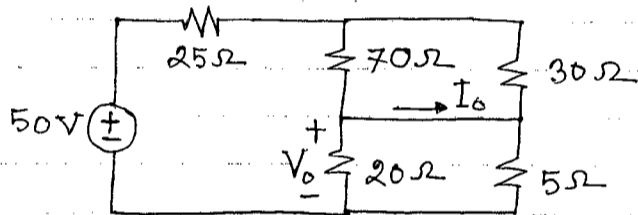
Figure. 5(a)

(b) Find R_{eq} at the terminals a-b for the circuit shown in Figure 5(b). **(18)**
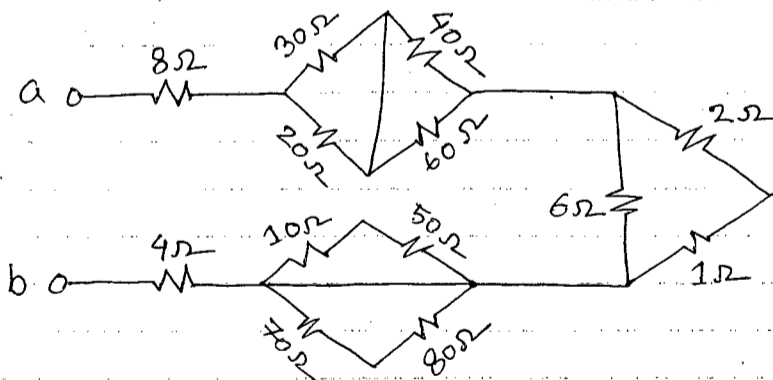
Figure 5(b)

6. (a) Using nodal analysis, find v_0 and i_0 in the circuit of Figure 6(a) **(17)**
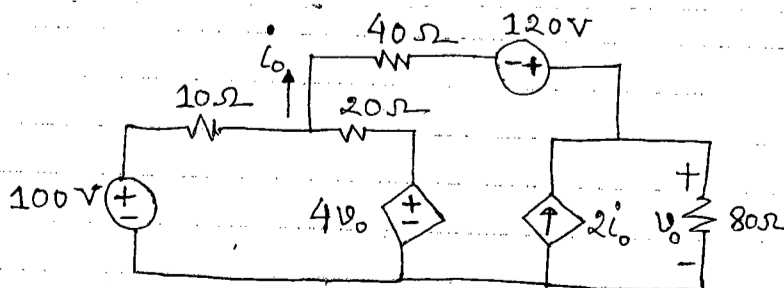
Figure 6(a)

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Contd ... Q. No. 6

(b) Use mesh analysis to obtain V_x and I_x in the circuit of Figure 6(b) **(18)**
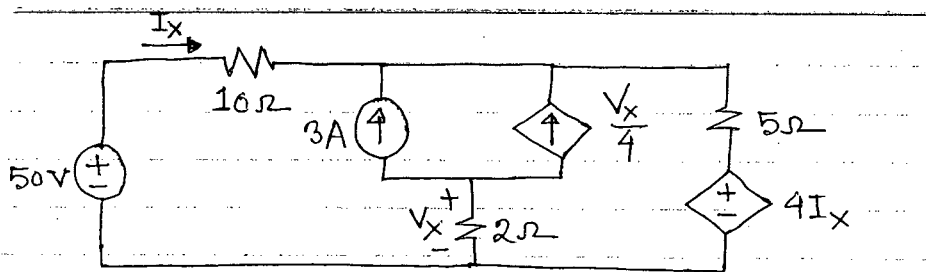
Figure 6(b)

7. (a) Use Superposition principle to find v_x in the circuit of Figure 7(a) **(17)**
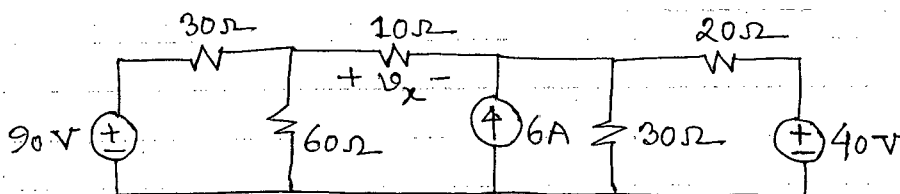
Figure 7(a)

(b) Using source transformation find the voltage V_x in the circuit of Figure 7(b). Show each step of your calculation as you apply the concept of source transformation. **(18)**
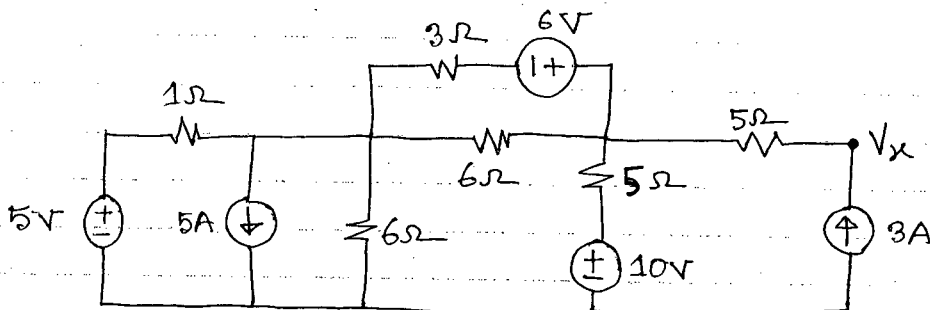
Figure 7(b)

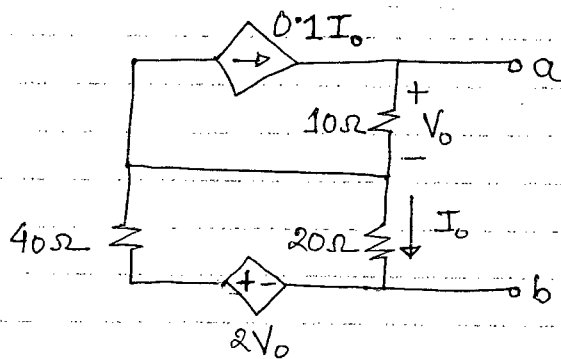8. (a) Find the Norton's equivalent circuit at terminals a-b of the circuit in Figrue 8(a) **(17)**

Figure 8(a)

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Contd ... Q. No. 8

(b) Find the maximum power transferred to resistor R in the circuit of Figure 8(b)   **(18)**

Figure 8(b)