App. Maths. III

Con. 3528–08. [REVISED COURSE] CO–9523

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) State and prove Parseval's identity over $(c, c + 2l)$. 5

(b) Find orthogonal trajectories of the family of curves $e^{-x} \cos y + xy = \text{const.}$ 5

(c) Find $L^{-1}\left\{\frac{2}{(s+1)^2\,(s^2+4)}\right\}$. 5

(d) S.T. every square matrix can be uniquely expressed as a sum of Hermitian and Skew–Hermitian matrix. 5

2. (a) Solve using Laplace transform – 6

$$\frac{dy}{dt} + 2y + \int_0^t y\,dt = \sin t \text{ . given } y(0) = 1.$$

(b) Find analytic function f(z) whose real part is $\frac{\sin 2x}{\cosh 2y + \cos 2x}$. 6

(c) (i) If 'A' is a nonsingular square matrix of order 'n' then S.T. 4

$$\text{adj}\cdot(\text{adj}\cdot A) = |A|^{n-2}.A.$$

(ii) Verify $A(\text{adj}\cdot A) = |A|\,I$ 4

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

3. (a) Use Laplace transform to evaluate – 6

$$\int_0^\infty \int_0^t e^{-t}\,\frac{\sin u}{u}\,du\,dt.$$

(b) S.T. every bilinear transformation is the resultant of three basic transformations. 6

(c) Find Fourier series for – 8

$$f(x) = \left(\frac{\pi - x}{2}\right)^2 \quad \text{over } (0, 2\pi).$$

Hence S.T. (i) $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} \ldots\ldots\ldots$

(ii) $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} \ldots\ldots\ldots$

4. (a) Find A^{-1} by using elementary transformations – 6

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

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(b) Find Fourier series for – 6

$f(x) = x \cos x \; ; \; -\pi < x < \pi.$

(c) S.T. the relation $W = \dfrac{iz+2}{4z+i}$ transforms the real axis in z–plane into a circle in w–plane. 8

Find its centre and radius. Also find the point in z–plane which is mapped on the centre of the circle in w–plane.

5. (a) For what values of λ and μ the system 6

$x + y + z = 6$

$x + 2y + 3z = 10$

$x + 2y + \lambda z = \mu$

has (i) no solution (ii) unique solution (iii) more than one solutions.
Also find parametric solution.

(b) Find half range Cosine series for 6

$$f(x) = \begin{cases} 1 & 0 < x < 1 \\ x & 1 < x < 2 \end{cases}$$

(c) Find (i) $L^{-1}\left\{\dfrac{e^{-\pi s}}{s^2-2s-2}\right\}$ 4

(ii) $L^{-1}\left\{\dfrac{1}{(s^2-q^2)^2}\right\}$ 4

6 (a) If $f(t) = \begin{cases} 1 & 0 \le t \le 1 \\ 0 & 1 < t < 2 \end{cases}$ 6

and $f(t) = f(t+2)$ then

S. T. $L\{f(t)\} = \dfrac{1}{s(1+e^{-s})}$.

(b) Define orthogonal and orthonormal set of functions. S.T. $\{\sin n x\}_{n = 1, 2, 3, \ldots}$ is orthogonal set of functions over $[0, \pi]$. Hence construct orthonormal set of functions. 6

(c) Find Fourier series for 8

$f(x) = 2x - x^2 \; ; \; 0 \le x \le 2.$

7. (a) Find complex form of Fourier series for – 6

$f(x) = e^{ax} \; ; (-L, L).$

(b) Find (i) $L\left\{\dfrac{\sqrt{1+\sin 4t}}{e^{2t}}\right\}$ 3

(ii) $L\{(t \sin 2t)^2\}$. 3

(c) State convolution theorem and use it to find $L^{-1}\left\{\dfrac{s}{(s^2+4)^2}\right\}$. 8

OR

(c) Define cross ratio. Find Bilinear transformation which transforms point $z = i, 1, -1$ into $w = 1, 0, \infty$ respectively. 8

Nabrany S.E. (Electrical) III (Rev.) 4/6/08

Numerical Techniques MAY 08

Con. 2629-08. (REVISED COURSE) CO-9517

(3 Hours) [Total Marks : 100

N.B. (1) Question No. 1 is compulsory.
(2) Attempt any four out of remaining six questions.
(3) Make suitable assumptions if required and justify the same.
(4) Write programs in C/C++.

1. (a) Define Inherent, Truncation and Round-off error and give an example for each. 5

(b) Prove that 5

i) $\mu = \frac{1}{2}[E^{\frac{1}{2}} + E^{-\frac{1}{2}}]$ ii) $\mu^2 = 1 + \frac{\delta^2}{4}$

(c) Using Picard's method solve 5

$\frac{dy}{dx} = 1 + xy$ such that $y = 0$ when $x = 0$.

(d) Derive Newton - Raphson formula. 5

2. (a) List the bracketing methods and open methods and find the real root of the equation 10
$x^3 - 4x - 9 = 0$ using bisection method correct to three decimal places.

(b) Solve the following equations by Gauss - Seidel method.

$27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$. 10

3. (a) From the following table find the number of students who obtained marks less than 45. 10

Marks	30-40	40-50	50-60	60-70
No. of students	31	42	51	35

(b) Using Newton's divided difference formula, find the value of f(9) from the following table. 10

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

4. (a) Write a program for Lagrange's interpolation method and using this formula, find the value of y when $x = 10$ from the following table. 10

x	5	6	9	11
y	12	13	14	16

(b) Fit a straight line to the following data by the method of least squares 10

x	1	2	3	4	5	6	7
y	0.5	2.5	2.0	4.0	3.5	6.0	5.5

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S. E (E&TC) II Rev

Con. 2629-CO-9517-08. Num. Techniques 4/6/08

5. (a) The velocity of the train which starts from rest is given by the following table, the time being reckoned in minutes from the start and speed in km/hour. 10

Time	3	6	9	12	15	18
Velocity	22	29	31	20	4	0

Estimate approximately the distance covered in 18 minutes by Simpson's $3/8^{th}$ rule.

(b) Solve $\frac{dy}{dx} = 3x^2 + 2y$ with $x_0 = 0$, $y_0 = 1$ by Euler's modified formula find the value of y when $x = 0.1$ taking $h = 0.05$. 10

6. (a) Solve $\frac{dy}{dx} = 4x^2 + y$ with initial conditions $y(1) = 2$ and find y at $x = 1.2$, $x = 1.4$ by Runge - Kutta Method of Fourth Order taking $h = 0.2$. 10

(b) Using the following data, find x for which y is minimum and find this value of y. 10

x	3	4	5	6	7	8
y	0.205	0.240	0.259	0.262	0.250	0.224

7. (a) Explain the propagation of errors. 5

(b) Derive Newton Cotes integration formula and also write a program Simpson's $1/3^{rd}$ rule. 10

(c) Write a short note on Golden section search. 5

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Con. 2621-08. (REVISED COURSE) CO–9526

(3 Hours) [Total Marks : 100

N. B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of remaining questions.
(3) Figures to the **right** indicates **full** marks.

1. (a) State and define basic types of electrical measuring instruments. 20
(b) Derive the relation between the elecrostatic and electromagnetic system of unit.
(c) Explain why the Wheatstone bridge is not used for measuring low value of resistance.
(d) State the advantages and disadvantages of flux meter.

2. (a) Explain different types of error in detail. 10
(b) Use dimentional equation to find out whether the following expression is dimentionally correct or not. 10

$$R_4 = \frac{R_2\left(1+w^2 R_3^2 C_3^2\right)}{W^2 R_1 R_3 C_3}$$

where R_1, R_2, R_3 and R_4 are resistances.
C_3 is capacitance and
$W = 2\pi f$, f is frequency in Hz.

3. (a) What are the different difficulties encountered in the measurement of high resistance ? Explain how these difficulties are overcome. 10
(b) Describe the operation of vibration galvanometer and derive the expression for amplitude of vibration. 10

4. (a) A moving coil instrument gives a full scale deflection of 10 mA when potential difference across its terminal is 10 mV. 10
Calculate :—
(i) The shunt resistance required to be connected for a full scale deflection of 100 Amp.
(ii) Series resistance for full scale reading of 1000 Volt.
(b) Explain Hay's bridge for measuring self inductance. Draw neat circuit and phasor diagram. Derive expression for self inductance. 10

5. (a) Explain any one type of power factor meter. 10
(b) A energy meter is designed to make 1200 revolution of disc for one unit of energy (kWh). Calculate the number of revolution made by it when connected to load carrying 10 A, at 240 V and 0·4 power factor for 1 hour. If it actually make 1140 revolution. Find the percentage error. 10

6. (a) Draw the equivalent circuit and phasor diagram of a potential transformer. Derive the expression for ratio and phase angle error. 10
(b) Explain the Laboratory type of d.c. potentiometer in detail. 10

7. Write short notes on any **three** :— 20
(a) Synchroscope
(b) Megger
(c) Frequency Meter
(d) Epstein Square Method
(e) Paramagnetism and Ferromagnetism.

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26 May 08 S.E. (Elect.) III (Rev) Digital Electronics Wb.

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Con. 2611–08.

(REVISED COURSE)

CO–9512

(3 Hours)

[Total Marks : 100]

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) Explain Gray Code and give applications. 6
(b) Explain Error Correcting Codes. 6
(c) Convert from Hex to Binary $(0{\cdot}A25)_{16}$. 4
(d) Convert $(371)_8$ to equivalent hexadecimal form. 4

2. (a) Explain Alphanumeric Codes. 4
(b) Peform following conversions : 6
(i) $(919{\cdot}89)_{10}$ to binary
(ii) $(625{\cdot}625)_{10}$ to octal.
(c) Peform the following arithmatic : 10
(i) $(11001)_2 \times (110)_2$
(ii) $1101001 \div 101$

3. (a) Simplify the following using Boolean theorems : 10
(i) $[(A + \bar{A}B)\ (A + \bar{A}\bar{B})]\ [(CD + \bar{C}\bar{D}) + (C \oplus D)]$.
(ii) $\bar{X}\bar{Y}\bar{Z} + \bar{X}Y\bar{Z} + X\bar{Y}\bar{Z} + XY\bar{Z}$.
(b) Implement the following using 2 input NOR gates : 10
(i) $Y = \bar{A}B + \bar{B}C$
(ii) $Z = A \oplus B$.

4. (a) Explain Ring Counter. 8
(b) Write short notes on :– 12
(i) Programmable logic array
(ii) Serial in Parallel out register.

5. (a) Write short notes on :– 10
(i) Fan out, Fan in
(ii) Propagation Delay.
(b) Explain interfacing of following logic families : 10
(i) TTL driving CMOS
(ii) CMOS driving TTL.

6. (a) Explain what is master slave flip–flop and give its applications. 10
(b) Give difference between synchronous counter and asynchronous counter. Give merits and demerits of these counters. 10

7. (a) Simplify this using K–map. 8
$F(A, B, C, D) = \Sigma m\ (1, 5, 6, 7, 11, 12, 13, 15)$.
(b) Minimise expression using Quine–McCluskey method. 12
$f(A, B, C, D) = \Sigma m\ (1, 3, 5, 10, 11, 12, 13, 14, 15)$.

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Library S.E. (Elect.) III (Rev.) 21/5/08.

Basic Electronics.

Con. 2744-08. (REVISED COURSE). CO-9520

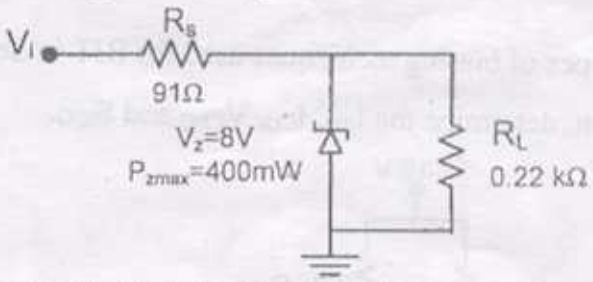
(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
(2) Solve any **four** questions from remaining **six** questions.
(3) Assume **suitable** data wherever **required**.

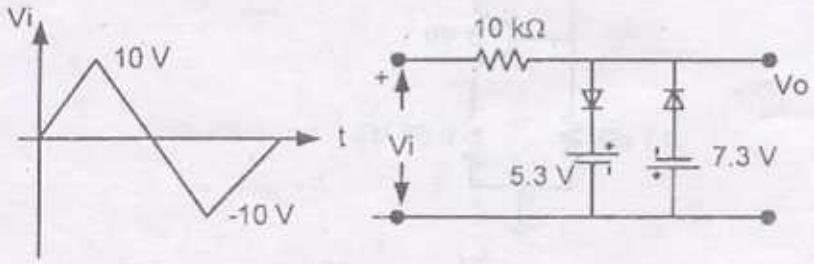
1. a. When a pn-junction is forward biased, the barrier potential is wiped off, why? 04

b. Difference between BJT and FET 04

c. For the circuit of fig. determine the range of V_i that will maintain V_L at 8 V and not exceed the maximum power rating of the Zener diode. 04



d. Sketch V_o for the network of fig. for the input shown. 04



e. Define operating point of transistor. What do you understand by stabilization of operating point? 04

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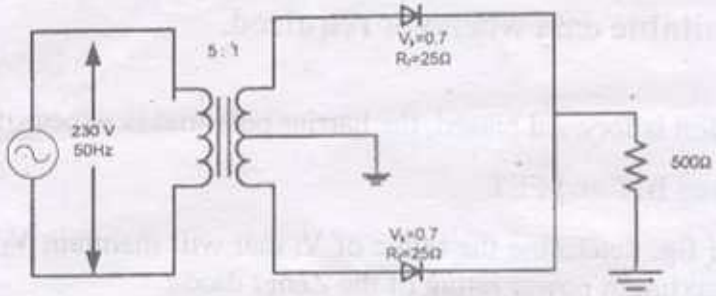
S.E (ETRX) III Rev Basic Electronics

21/5/08

2. a. Draw the circuit diagram of a capacitor filter with FWR. Derive the expression for ripple factor for such a circuit? 10

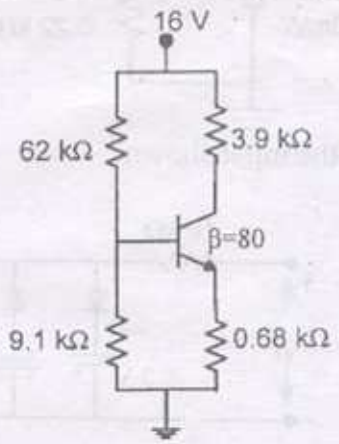
b. For the circuit shown in fig, determine 10

1. d.c. output voltage
2. Rectification efficiency
3. PIV
4. Output frequency.



3. a. Explain different types of biasing techniques used for BJT in detail. 10

b. For the circuit shown, determine the I_{BQ}, I_{CQ}, V_{CEQ} and S_{ICO}. 10



4. Design a single stage CE amplifier to meet following specifications:- 20
$|A_v| \geq 100$, S=10, f_L=20Hz, Use Transistor parameters as $h_{FE}=h_{fe}=220$, $h_{ie}=2.5k\Omega$ neglect h_{re} and h_{oe},

5. a. Explain Hall effect and derive the equation for hall coefficient. 10

b. What is polarization? Explain the types of polarization in details. 10

6. a. Give the methods used for biasing the JFET with operating point values. 08

b. Design a single Stage CS amplifier for audio frequency range using JFET for the voltage gain of 12. Use JFET parameters as I_{DSS}=7mA, V_p=-2.5V, g_{mo}=5600μmho, rd=50kΩ. 12

7. Write notes on 20

1) Types of capacitors
2) Difference between series and shunt regulator.
3) Solar cell and its applications.

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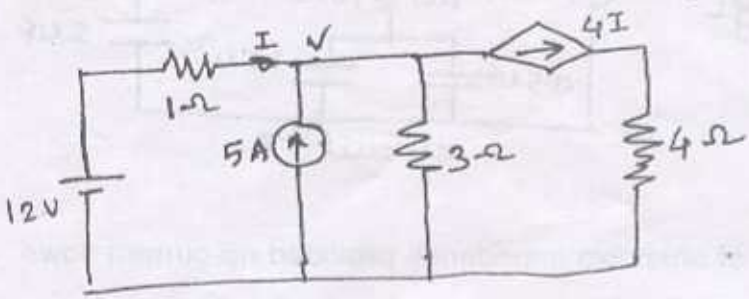
Con. 3488-08. (REVISED COURSE) CO-9514

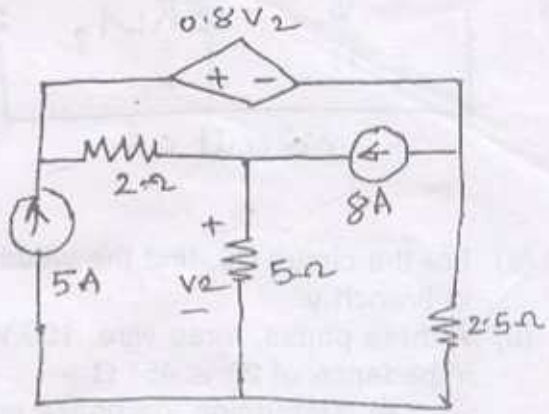
(3 Hours) [Total Marks : 100

N.B. (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from remaining.
(3) Assume **suitable** data if **necessary**.

1. (a) For the circuit **C1**, find the power delivered by dependent current source. 8
(b) Use Superposition theorem to find voltage v2 in circuit **C2**. 8



circuit C1

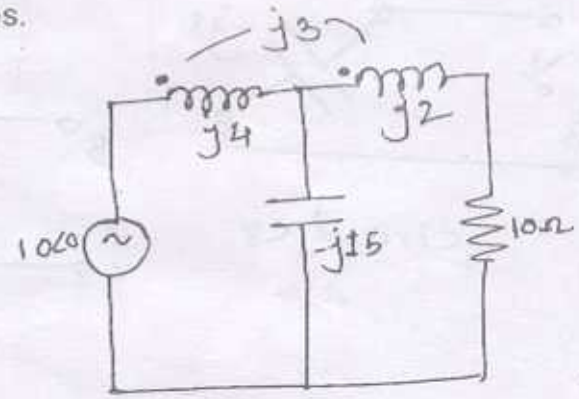


circuit C2

(c) Write short notes on Initial Conditions. 4

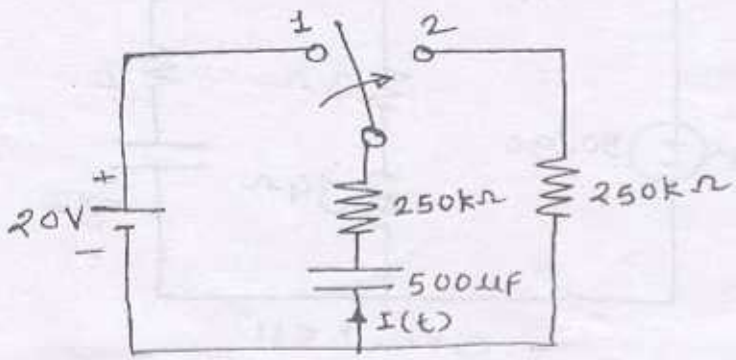
2. (a) Find the drop across 10 Ω resistor for circuit **C3**.
(b) The reduced incidence matrix of an oriented graph is given —
(i) Draw the graph.
(ii) How many trees are possible ?
(iii) Write tieset and cutest matrices.

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

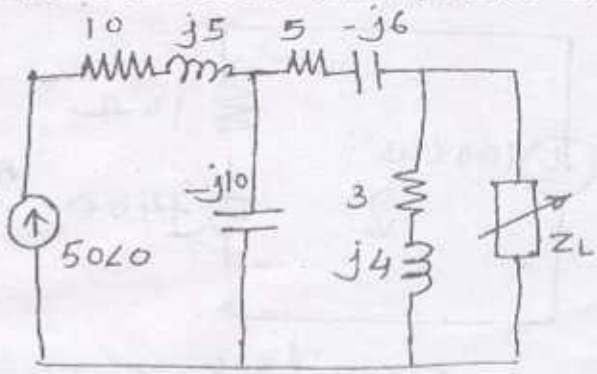


circuit C3

3. (a) Switch in circuit **C4**, is changed at t = 0 from position 1 to 2, solve for I(t).
(b) For the circuit **C5**, determine the maximum power delivered to load impedance ZL.



circuit C4



circuit C5

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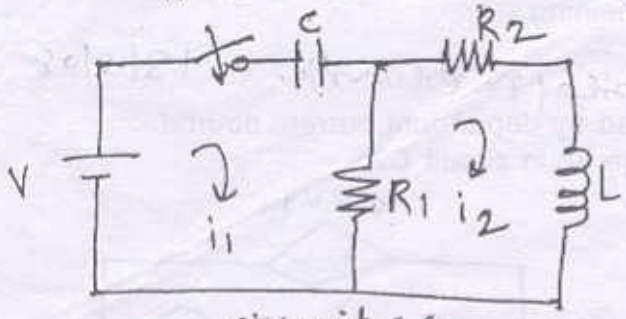
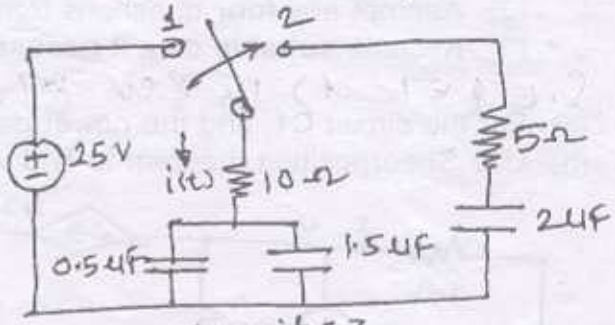
4. (a) Determine i_1, i_2, di_1/dt, di_2/dt, d^2i_1/dt^2 and d^2i_2/dt^2 for circuit **C6**.
   (b) The circuit **C7** is in position 1 at t = 0, after t = 3 J switch is changed to position 2. find the transient current i(t) for —
   (i) $0 < t < 3J$ and (ii) $t > 3J$ (J → time constant)

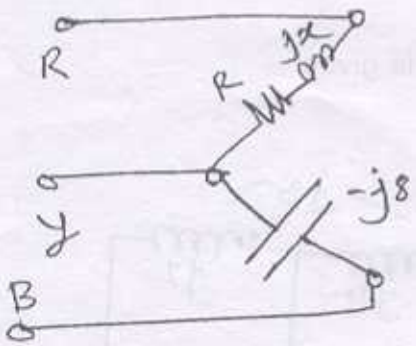


circuit C6.

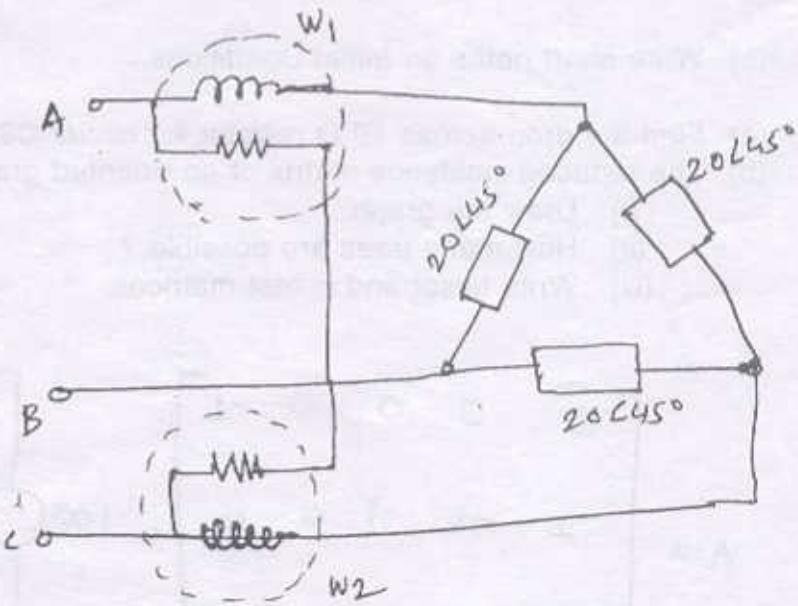


circuit C7.

5. (a) For the circuit **C8**, find the value of unknown impedance provided no current flows in branch y.
   (b) A three phase, three wire, 100 V, ABC system supplies a balanced delta load with impedance of $20 \angle 45° \Omega$:—
   (i) Determine the phase and line currents and draw the phasor diagram.
   (ii) Find the wattmeter readings when two wattmeter method is used. (Refer **C9**).

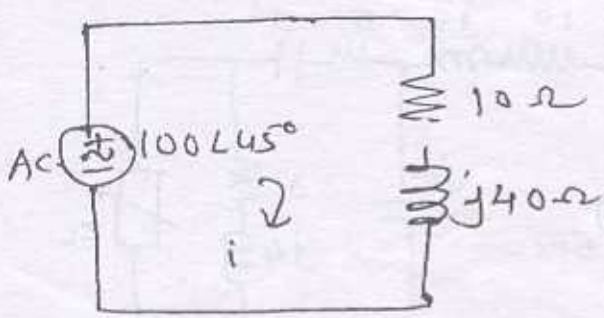


circuit C8

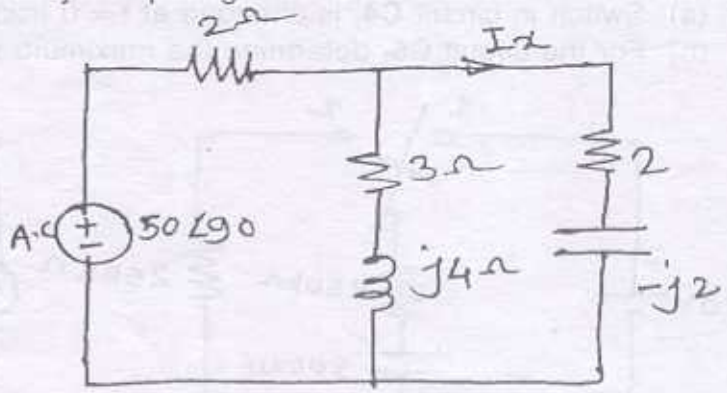


circuit C9

6. (a) Using the Compensation theorem, calculate the change in current in the circuit **C10**, when reactance is change to j35.
   (b) Demonstrate the reciprocity theorem by computing Ix for circuit **C11**.



circuit C10



circuit C11

7. (a) Explain how reactive power can be measured with the help of wattmeter.
   (b) What do you mean by critical resistance, explain the terms over damped, under damped and critically damped system with respect to series RLC circuit.

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