2016

(CBCS)

ELECTRONICS

Paper : EL–101

(Electronic Instruments and Circuit Analysis)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* Explain the meaning of power rating of a resistor. What is a variable resistor? Explain how potentiometer can be used to control the tone in a circuit. 1+1+3=5

(b) What do you mean by inductance of a coil? Two coils each having an inductance of 250 H have combined inductance of 550 H when connected series-aiding and 450 H when connected series-opposing. Calculate *(i)* their mutual inductance and *(ii)* coefficient of coupling. 1+2+2=5

Or

(c) Explain the meaning of voltage rating of a capacitor. Describe the constructional details of ceramic capacitors. Give some advantages of ceramic capacitor over other non-electrolytic capacitors. 1+3+1=5

(d) What is meant by tolerance of a resistor? Why do you need colour code for resistors? Find the resistance of a carbon composition resistor having yellow, violet, orange and silver colour band. Write down the uses of a resistor. 1+1+2+1=5

2. *(a)* What is multimeter? Define the sensitivity of a multimeter. Explain with circuit diagram, the working of multimeter as voltmeter. 1+1+3=5

(b) With circuit diagram, explain the construction and operation of bridge rectifier voltmeter. An a.c. voltmeter uses a bridge rectifier with silicon diodes and a permanent magnet moving-coil instrument with full-scale deflection current of 75 A. If meter coil resistance is 900 and the multiplier resistor is 708 k , calculate the applied r.m.s. voltage when the meter reads full-scale deflection. 3+2=5

Or

(c) What is a VTVM? Explain balanced bridge-type VTVM with a neat circuit diagram. 1+3=4

(d) Explain the construction and working of cathode-ray tube (CRT). 6

3. *(a)* Derive an expression for resonant frequency for a parallel resonant circuit. 4

(b) In a series *R-L-C* circuit, L = 1·5 H, R 45 and C 22 F. Calculate *(i)* the frequency at resonance, *(ii)* the current drawn from supply when voltage is 120 V and *(iii)* the voltage across the capacitor. 2+2+2=6

Or

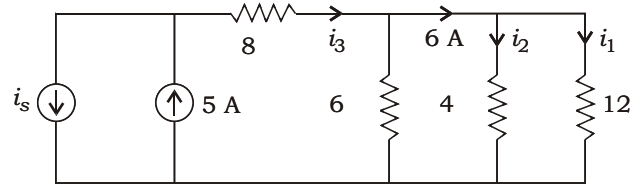
(c) Derive the voltage and current relations in a.c. circuit containing *R* and *C*. 3

(d) A series *R-L-C* circuit is connected to a 230 V, 50 Hz single-phase AC supply. the value of R = 50 , L = 13 mH and C = 140 F. Find *(i)* total reactance, *(ii)* impedance, *(iii)* current drawn by the circuit, *(iv)* power factor of the circuit and *(v)* how long does one cycle of this a.c. supply last. 2+1+1+2+1=7

4. *(a)* How will you convert a current source into voltage source? 2

(b) Differentiate between *(i)* active and passive elements and *(ii)* open and short circuits. 2+2=4

(c) Use current divider formula to determine i_1, i_2, i_3 and i_s from the figure given below : 4

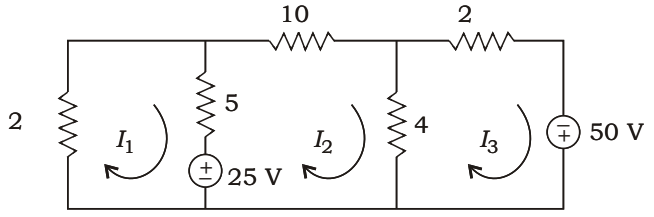


Or

(d) What is Kirchhoff's current and voltage law? 2

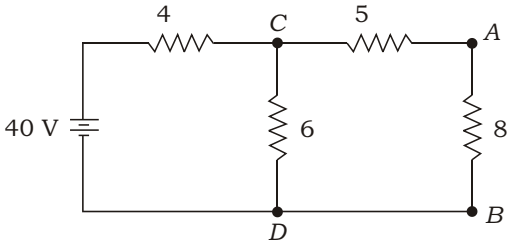
(e) Derive an expression for current division law. 3

(f) Find I_1, I_2 and I_3 using mesh analysis from the figure given below : 5



5. *(a)* State and prove reciprocity theorem. 4

(b) State Norton's theorem. Using Norton's theorem, calculate the current flowing through the 8 resistor as shown below : 2+4=6



Or

(c) State and illustrate Thevenin's theorem. 4

(d) What is maximum power transfer theorem? A generator develops 200 V and has an internal resistance of 100 . Find the power delivered to a load of *(i)* 100 and *(ii)* 300. 2+4=6

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Subject Code :
EL/I/EC/01 (CBCS)

Booklet No. A

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CBCS
DEGREE 1st Semester
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INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
2. **This paper should be ANSWERED FIRST and submitted within 1 (one) Hour of the commencement of the Examination.**
3. **While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

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DEGREE 1st Semester
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Roll No. .....
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Paper .....

Descriptive Type
Booklet No. B .....

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(CBCS)

ELECTRONICS

Paper : EL-101

(Electronic Instruments and Circuit Analysis)

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 10)

Tick (✓) the correct answer in the brackets provided : 1×10=10

1. Current is directly proportional to the applied voltage in

(a) resistor ( )

(b) capacitor ( )

(c) inductor ( )

(d) series capacitor only ( )

2. A galvanometer in series with a high resistance is called

(a) an ammeter ( )

(b) a voltmeter ( )

(c) a wattmeter ( )

(d) an ohmmeter ( )

3. The RMS value of alternating current is _____ times the maximum value of current.

(a) 7·07 ( )

(b) 7 ( )

(c) 0·707 ( )

(d) 0·7 ( )

4. An ideal current source is one whose internal impedance is

(a) very low ( )

(b) zero ( )

(c) very high ( )

(d) infinity ( )

5. The impedance offered by a coil having both inductance and resistance is given as

(a) $Z \quad \sqrt{X_L^2 \quad R^2}$ ( )

(b) $Z \quad \sqrt{L_X^2 \quad R^2}$ ( )

(c) $Z \quad 1 \Big/ \sqrt{X_L^2 \quad R^2}$ ( )

(d) $Z \quad 1 \Big/ \sqrt{X_L^2 \quad R^2}$ ( )

6. For display of signal pattern, the voltage applied to the horizontal plates of a CRO is

(a) sinusoidal wave ( )

(b) rectangular wave ( )

(c) sawtooth wave ( )

(d) cosine wave ( )

7. The power factor at resonance in an AC circuit is

(a) –1 ( )

(b) 1 ( )

(c) 0 ( )

(d) ½ ( )

8. Superposition theorem can be applied only to circuit having _____ elements.

(a) non-linear ( )

(b) passive ( )

(c) linear ( )

(d) resistive ( )

9. The sum of resistances through which two current loops are passing is called

(a) mutual resistance ( )

(b) self-resistance ( )

(c) internal resistance ( )

(d) input resistance ( )

10. The efficiency of maximum power transfer is

(a) 75% ( )

(b) 25% ( )

(c) 60% ( )

(d) 50% ( )

SECTION—B

(*Marks* : 15)

Answer the following questions : 3×5=15

Unit—1

1. Write down different types of inductors according to their core and give a brief comparison between them.

Or

Explain different factors controlling the capacitance of a capacitor.

Unit—2

2. What are the essentials of an electronic instrument?

Or

With a circuit diagram, explain the operation of transistor voltmeter.

Unit—3

3. Discuss how band-pass filter works. List down some uses of filter circuits.

Or

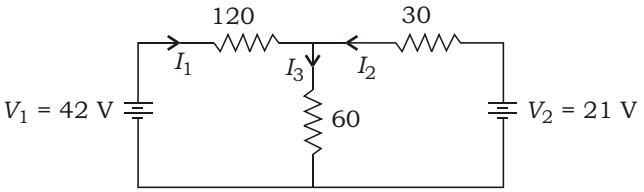
What is quality factor of resonant circuit? Derive an expression for quality factor of a series resonant circuit.

Unit—4

4. Explain briefly ideal and practical voltage source.

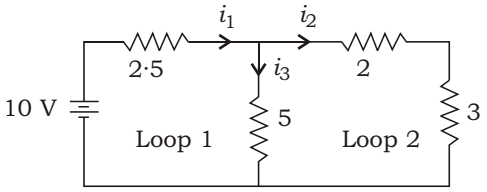
Or

Calculate the voltage and current in the following network using node voltage analysis :



Unit—5

5. From the circuit given below, find all the branch currents and voltage drops across all the resistors :



Or

Prove that the maximum power is transferred to the load when internal impedance is equal to load impedance.

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