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**( 1st Semester )**

**ELECTRONICS**

**FIRST PAPER**

**( Electronic Measuring Instruments and Circuit Analysis )**

**( PART : A—OBJECTIVE )**

**( Marks : 20 )**

**SECTION—A**

**( Marks : 5 )**

*Each question carries 1 mark*

**Answer all questions**

**Tick ( ✓ ) the correct answer in the bracket provided :**

**1. The first three colour bands of a resistor indicate**

- (a) tolerance (     )**
- (b) resistance value (     )**
- (c) reliability (     )**
- (d) decimal multiplier (     )**

2. Working of a transformer essentially depends on

(a) mutual inductance ( )

(b) self-inductance ( )

(c) magnetic circuit ( )

(d) magnetic flux ( )

3. Power factor of an a.c. circuit equals

(a) the cosine of the phase angle ( )

(b) the tangent of the phase angle ( )

(c) zero for resistive circuit ( )

(d) unity for a relative circuit ( )

4. According to Kirchhoff's voltage law, the algebraic sum of all IR drops and EMFs in any closed loop of a network is always

(a) positive ( )

(b) negative ( )

(c) greater than unity ( )

(d) zero ( )

5. For abstracting maximum power from any two given terminals of a circuit, the load resistance across the terminals should be

- (a) four times the internal resistance of the network ( )
- (b) less than the circuit resistance ( )
- (c) equal to the circuit resistance when viewed back from the two terminals ( )
- (d) greater than the circuit resistance ( )

( 4 )

**SECTION—B**

( Marks : 15 )

*Each question carries 3 marks*

**Answer all questions**

1. Discuss the factors that control the capacitance of a capacitor.

**( 5 )**

**2. Explain the working of multimeter as voltmeter.**

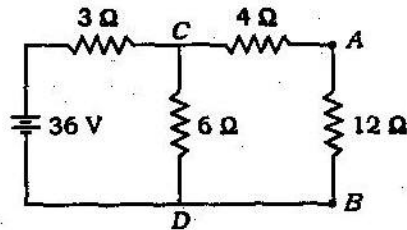
3. Show that  $Q = \frac{1}{R} \sqrt{\frac{L}{C}}$  for a series  $L$ - $C$ - $R$  resonant circuit.

( 7 )

4. Differentiate between unilateral and bilateral elements giving one example each.

( 8 )

5. Using Norton's theorem, calculate the current flowing through the  $12\ \Omega$  resistor in the figure given below :



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**( Electronic Measuring Instruments and  
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*Full Marks : 55*

*Time : 3 hours*

**( PART : B—DESCRIPTIVE )**

**( Marks : 35 )**

*The figures in the margin indicate full marks  
for the questions*

**UNIT—I**

1. (a) What is a variable resistor? Describe briefly wire-wound resistor and carbon composition resistor. 1+2+2
- (b) What do you mean by power rating of a resistor? 2

*Or*

- (a) Describe the construction of a ceramic capacitor. Why is ceramic capacitor preferred over mica or paper capacitor? 2+2

( 2 )

- (b) Compare air-core, iron core and ferrite core inductors.

3

UNIT—II

2. Describe in detail the construction and working principle of a transformer. Mention two uses of a transformer.

2+3+2

Or

Discuss the construction, principle of working and some applications of cathode ray oscilloscope (CRO).

2+3+2

UNIT—III

3. (a) What is  $j$ -operator? Briefly explain the significance of  $j$ -operator.  
(b) Define filter. Differentiate between high-pass and low-pass filter.

1+3

1+2

Or

- (a) Obtain an expression between current and voltage in an alternating circuit consisting of resistance  $R$  and inductance  $L$  in series.  
(b) A coil of resistance  $60\ \Omega$  and inductance  $3$  henry is connected in series with a capacitor of  $4\ \mu\text{F}$  and an a.c. supply of  $200$  volts and  $50$  c/s. Calculate (i) the impedance in the circuit, and (ii) phase difference between current and voltage.

3

2+2

( 3 )

UNIT—IV

4. (a) What are active and passive elements? Give one example each.  
(b) How will you convert a voltage source into a current source?

2+2

3

Or

- (a) State and explain ladder method of network analysis.  
(b) Define branch and node. Briefly explain nodal analysis.

4

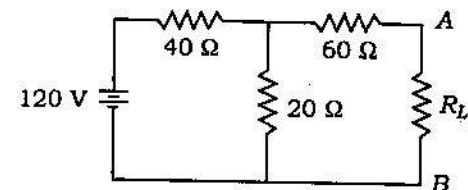
1+2

UNIT—V

5. (a) State and explain Thevenin's theorem.  
(b) Calculate the value of load resistance  $R_L$  to which maximum power may be transferred from the circuit below. Also find the maximum power transferred :

1+3

2+1



( 4 )

Or

- (a) State and explain superposition theorem. 1+3
- (b) Derive the condition for transfer of maximum power from a source to a load. 3

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