

**2 0 1 8**

( Pre-CBCS )

( 1st Semester )

**ELECTRONICS**

FIRST PAPER

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

*Full Marks : 55*

*Time : 2½ hours*

**( PART : A—OBJECTIVE )**

( Marks : 20 )

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

SECTION—A

( Marks : 5 )

Tick (✓) the correct answer in the brackets provided :

1×5=5

**1.** The fifth band of a resistor indicates

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

**2.** The main purpose of laminating a transformer core is to decrease its

- (a) electrical resistance ( )
- (b) reluctance ( )
- (c) eddy-current loss ( )
- (d) hysteresis loss ( )

3. In the relation,  $Z = R + jX$ ,  $X$  stands for
- (a) reactance ( )
  - (b) conductance ( )
  - (c) impedance ( )
  - (d) resistance ( )
4. What is the equivalent voltage for a current source of 7A in series with 5 resistance?
- (a) 30 V ( )
  - (b) 35 V ( )
  - (c) 5 V ( )
  - (d) 7 V ( )
5. Norton current is sometimes called the
- (a) shorted-load current ( )
  - (b) open-load current ( )
  - (c) Thevenin current ( )
  - (d) Thevenin voltage ( )

SECTION—B

( Marks : 15 )

Answer any *five* questions :

3×5=15

1. What do you mean by varactor? Give the difference between abrupt-junction and hyper-abrupt junction of a varactor.
2. Define transducer. What is the difference between passive and active transducers?
3. What is a variable resistor? Describe the working of potentiometer used in a tone control circuit.
4. How will you convert a current source into voltage source?
5. Prove that the maximum power is transferred to the load when internal impedance is equal to load impedance.
6. What are the uses of low-pass filters and high-pass filters?

7. Discuss the phase relation between voltage and current waves in a pure capacitor.
8. Differentiate between open and short circuit.

**( PART : B—DESCRIPTIVE )**

( Marks : 35 )

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

1. (a) What do you mean by voltage rating of capacitors? Describe the preparation and uses of electrolytic capacitors. 1+3=4
- (b) Define inductance. What are the different types of inductor? 1+2=3

**OR**

2. (a) Two carbon-composition resistors of yellow, green, black and brown, red, brown are connected in series. Calculate the combined resistance. 2
- (b) Compare air core, iron core and ferrite core of an inductor. Two coils each having an inductance of 250 H have coefficient of coupling  $k = 0.1$ . Calculate their mutual inductance. 3+2=5
3. What is a multimeter? Explain with circuit diagram, the working of multimeter as voltmeter and ammeter. 1+3+3=7

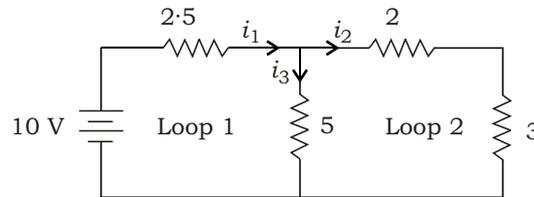
**OR**

4. (a) What are thermopiles? Describe the construction and working principle of thermocouples. 1+3=4
- (b) The hot junction of a thermocouple is shifted from an environment of 200 °C to an environment of 700 °C. If the time constant of thermocouple is one second, find the hot junction temperature after a time lapse of (i) 1 sec, (ii) 2 secs and (iii) 5 secs. 3
5. (a) Write down the differences between bandpass and bandstop filters. 3
- (b) What is  $j$  operator? Discuss the significance of  $j$  operator. 1+3=4

**OR**

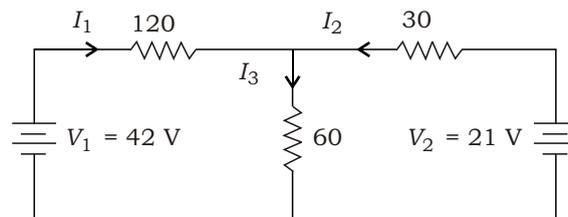
6. (a) Derive the voltage and current relations in an a.c. circuit containing  $R$  and  $C$ . 3
- (b) What are acceptor and rejector circuits? Derive the value of resonant frequency for a rejector circuit. 1+3=4

7. (a) What is lumped circuit? Differentiate between linear and non-linear elements. 1+2=3
- (b) From the circuit, find all the branch current and voltage drops across all the resistors : 4



**OR**

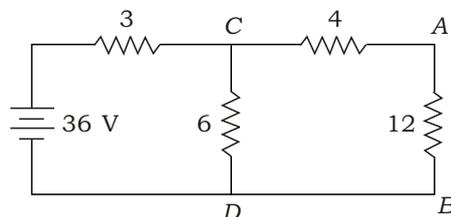
8. (a) Explain briefly ideal and practical voltage sources. 3
- (b) Calculate the voltage and current in the following network using node voltage analysis : 4



9. (a) State and explain reciprocity theorem. 1+3=4
- (b) 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 . 3

**OR**

10. (a) Write the statement and illustration of Norton's theorem. 4
- (b) In the following circuit, apply Thevenin's theorem to find current through the 12 resistor : 3



★ ★ ★