

Code : 031201

B.Tech 2nd Semester Exam., 2018

BASIC ELECTRICAL ENGINEERING

Time : 3 hours

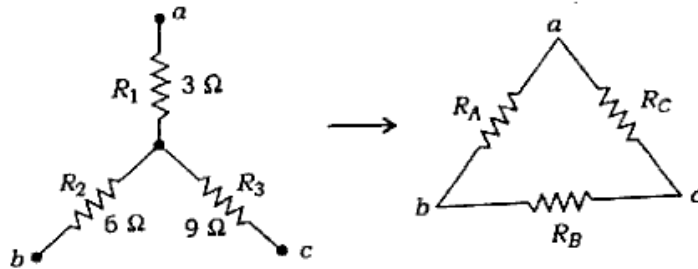
Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
 (ii) There are **NINE** questions in this paper.
 (iii) Attempt **FIVE** questions in all.
 (iv) Question No. 1 is compulsory.

1. Choose the correct answer of the following
 (any seven) : 2×7=14

- (a) A star-connected network which is equivalent to the delta network is shown in the figure given below. The R_A , R_B and R_C (in ohm) are respectively



- (i) 99 Ω , 33 Ω , 16.5 Ω
 (ii) 11 Ω , 16.5 Ω , 33 Ω
 (iii) 11 Ω , 33 Ω , 16.5 Ω
 (iv) 1 Ω , 3 Ω , 1.5 Ω

(Turn Over)

(b) Superposition theorem is not applicable for

- (i) voltage calculation
 (ii) bilateral elements
 (iii) power calculation
 (iv) passive elements

(c) Nodal analysis is based on

- (i) KCL
 (ii) KVL
 (iii) Both (i) and (ii)
 (iv) law of conservation of energy

(d) The r.m.s. value of sine wave is 100 A. Its peak is

- (i) 70.7 A
 (ii) 141 A
 (iii) 150 A
 (iv) 282.8 A

(3)

(e) A voltage is represented by a sine wave and has a maximum value of 100 V. Its r.m.s. and average value are respectively

- (i) 70.7 V, 63.6 V
- (ii) 0.707 V, 0.637 V
- (iii) 70.7 V, 0.63 V
- (iv) 0.707 V, 63.6 V

(f) An a.c. source of 200 V r.m.s. supplies active power of 600 W and reactive power of 800 VAR. The r.m.s. current drawn from the source is

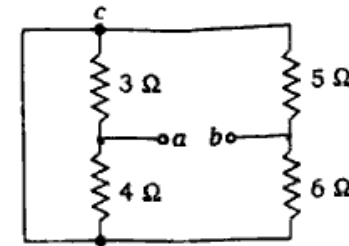
- (i) 10 A
- (ii) 5 A
- (iii) 3.75 A
- (iv) 2.5 A

(g) The hysteresis and eddy current losses of a 1- ϕ transformer working on 200 V, 50 Hz supply are P_h and P_e respectively. The percentage decrease in these losses when operated at 160 V, 40 Hz supply are respectively

- (i) 32, 36
- (ii) 20, 36
- ~~(iii) 25, 50~~
- (iv) 40, 80

(4)

(h) The resistance between the terminals a-b, in the network shown in the figure given below, is



- (i) 4.44 Ω
- (ii) 6.66 Ω
- (iii) 7.77 Ω
- (iv) 2.22 Ω

(i) The average value of a sinusoidal waveform for complete cycle (v_{av}) is

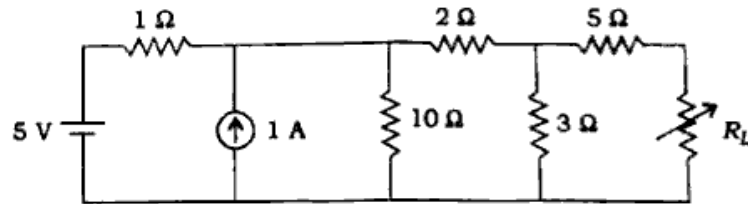
- (i) $0.637 V_m$
- (ii) $0.707 V_m$
- (iii) 0
- (iv) None of the above

(j) In a three-phase system, voltages differ in phase by

- (i) 30°
- (ii) 90°
- (iii) 60°
- (iv) 120°

(5)

2. (a) State and explain maximum power transfer theorem. 7
- (b) Find the value of resistance R_L in the figure given below for maximum power transfer and calculate maximum power : 7



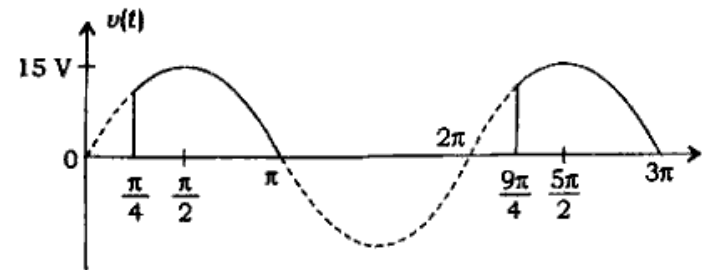
3. (a) Define r.m.s. value and average value of sinusoidal waveform. 7
- (b) An RLC series circuit with a resistance of $10\ \Omega$, an inductance of $0.2\ \text{H}$ and a capacitance of $40\ \mu\text{F}$ is supplied with a $100\ \text{V}$ supply at variable frequency. Find the following with respect to the series resonant circuit :
- (i) Frequency of which resonance takes place
 - (ii) Current
 - (iii) Power
 - (iv) Power factor
 - (v) Voltage across RLC at that time
 - (vi) Quality factor
 - (vii) Half-power points 7

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(Turn Over)

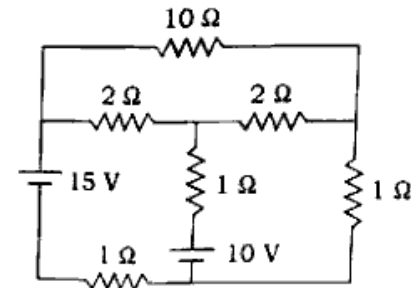
(6)

4. (a) Define the following : 4
- (i) Peak factor
 - (ii) Form factor
- (b) The output voltage of an electronic device is given in the following figure :



Determine (i) the average value and (ii) the r.m.s. value of the voltage. 10

5. (a) State and explain Thevenin's theorem. 7
- (b) Find the current through $10\ \Omega$ resistor in the following figure by Thevenin's theorem : 7

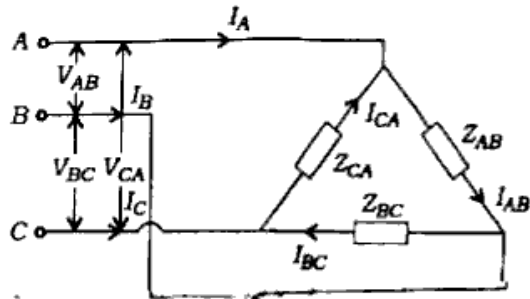


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(Continued)

(7)

6. In the circuit of figure given below, a 400 V, 50 Hz, 3-phase supply of phase sequence ABC is supplied to a delta-connected load consisting a 100Ω resistor between lines A and B, a 378 mH inductor between lines B and C, and a $37.8 \mu\text{F}$ capacitor between lines C and A. Determine phase and line currents. 14



7. (a) Explain B-H curve with neat diagram. 7
(b) A coil of 200 turns is wound uniformly over a wooden rim having a mean circumference of 60 cm and uniform cross-sectional area of 5 cm^2 . If the current through the coil is 4 A, calculate (i) the magnetomotive force, (ii) the total flux and (iii) the flux density. 7
8. (a) What are the different types of moving-coil instrument? Explain any one in detail. 7

(8)

- (b) What are the different types of controlling torque? Explain any one in detail. 7

9. Write short notes on any two of the following : 7×2=14

- (a) Star-delta conversion
(b) Superposition theorem
(c) Moving-iron instruments

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