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.

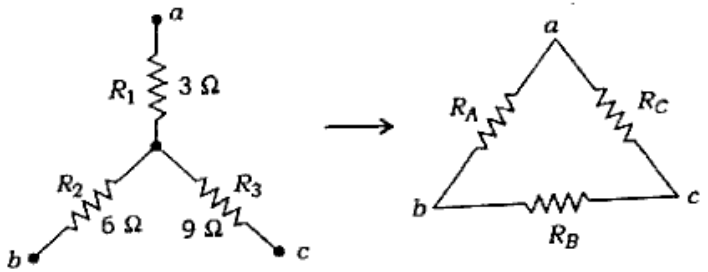
*(ii) There are **NINE** questions in this paper.*

*(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

(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

(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

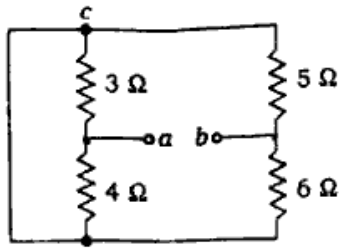
(ii) 20, 36

(iii) 25, 50

(iv) 40, 80

(Turn Over)

(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°

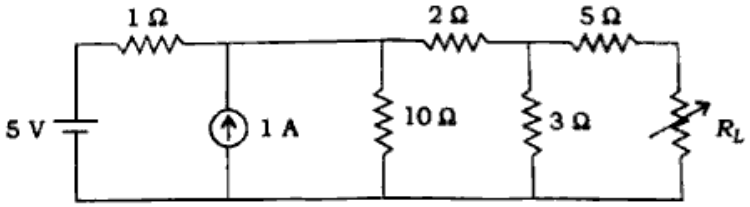
(iii) 60°

(iv) 120°

(Continued)

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 Ω, a inductance of 0·2 H and a capacitance of 40 μF is supplied with a 100 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

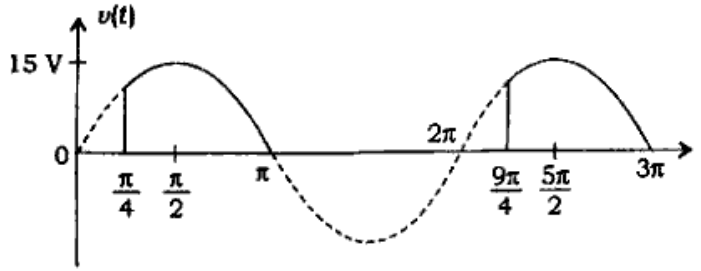
(vii) Half-power points 7

4. *(a)* Define the following : 4

(i) Peak factor

(ii) Form factor

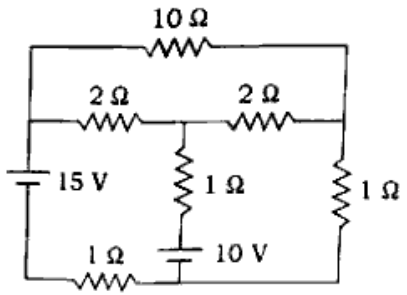
(b) The output voltage of an electronic device is given in the following figure :



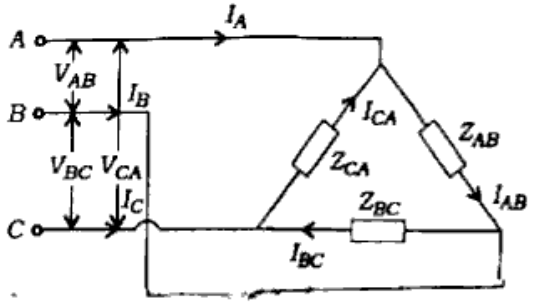
Determine *(i)* the average value and *(ii)* the r.m.s. value of the voltage. 10

5. *(a)* State and explain Thevenin's theorem. 7

(b) Find the current through 10 Ω resistor in the following figure by Thevenin's theorem : 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 100 Ω resistor between lines *A* and *B*, a 378 mH inductor between lines *B* and *C*, and a 37·8 μF 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

(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