

BTECH
(SEM-IV) THEORY EXAMINATION 2017-18
BASIC ELECTRICAL ENGINEERING

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief.

2 x 7 = 14

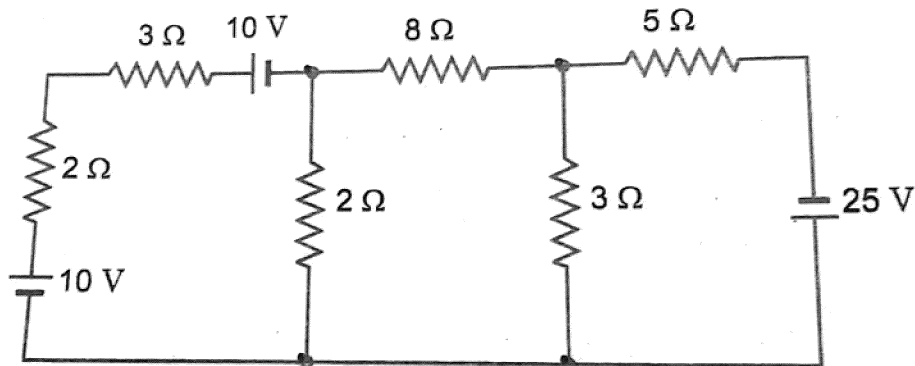
- a) Define active and passive elements.
- b) Define unilateral and bilateral elements.
- c) Write a note on: Amplitude, mechanical degrees and angular velocity.
- d) Explain the form factor and peak factor.
- e) Differentiate between star and delta connections.
- f) What information is obtained from the loop?
- g) What is meant by the term speed regulation?

SECTION B

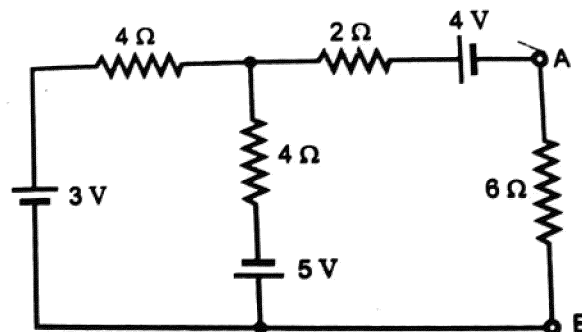
2. Attempt any *three* of the following:

7 x 3 = 21

- a) Using nodal analysis, find the current through $8\ \Omega$ resistor.



- b) Calculate the current in the $6\ \Omega$ resistance by using Norton's theorem.



- c) A balanced star-connected load of $(8+j6) \Omega$ per phase is connected to a balanced 3-phase, 400 V supply. Find the line current, power factor, power and total volt-amperes.
- d) A single phase, 50Hz, core type transformer has square cores of 20 cm side, permissible maximum flux density is 1 Wb/m^2 . Calculate the number of turns per limb on the high and low voltage sides for a 300/220 V ratio.
- e) A 12-pole, 3-phase alternator is coupled to an engine running at 500 rpm. This alternator supplies an induction motor running at 1450 rpm. Find slip and number of poles of the induction motor.

SECTION C

3. **Attempt any *one* part of the following:** **7 x 1 = 7**
 - a) The equation of an alternating current $i = 42.42 \sin 628 t$. Determine (i) maximum value (ii) frequency (iii) rms value (iv) average value (v) form factor.
 - b) Derive expressions for average value and rms value of a sinusoidally varying AC voltage.
4. **Attempt any *one* part of the following:** **7 x 1 = 7**
 - a) Derive expressions for impedance, current and power factor for an R-L-C series circuit when applied with AC voltage. Draw also the vector diagram.
 - b) Derive an expression for parallel resonance and mention its salient features.
5. **Attempt any *one* part of the following:** **7 x 1 = 7**
 - a) Derive the relationship between line current and phase current for delta connected 3-phase load when supplied from 3-phase balanced supply.
 - b) Explain the working of a moving iron type instrument. Derive the expression for torque produced.
6. **Attempt any *one* part of the following:** **7 x 1 = 7**
 - a) Define self-inductance and mutual-inductance. What are hysteresis loss and eddy current losses?
 - b) Discuss the principle of operation of a single-phase transformer. Derive emf equation for a single-phase transformer.
7. **Attempt any *one* part of the following:** **7 x 1 = 7**
 - a) Explain the principle of operation of a 3-phase synchronous motor.
 - b) Explain principle of operation of 1-phase induction motor using two revolving field theory. List various methods of starting.