Total No. of printed pages = 7

ET 131204

Roll No. of candidate

2017

B. Tech 2nd Semester End-Term Examination

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING - II

Full Marks–100 Pass Marks–35 Time–Three hours

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

1. Answer any *six* of the following questions : 6×2=12

(a) With reference to the winding of a DC Machine, what is full pitched winding ?

(b) State the condition for maximum efficiency of DC Machines.

(c) Why are Transformers called the most efficient of all electrical machines ?

(d) A Transformer has 800 primary turns and 2000 secondary turns. If the primary voltage is 160V, determine the secondary voltage assuming an ideal transformer.

[Turn over

(e) Convert $(25)_{10}$ to binary.

(f) Convert the hexadecimal number 7D8 to its equivalent binary number.

(g) Why are BJT's called bipolar semiconductor devices ?

(h) For a BJT with $\alpha = 0.92$, calculate β.

2. Answer any *six* of the following questions : 6×3=18

(a) List the essential parts of a DC generator.

(b) Draw the phasor diagram of a Transformer with core losses (under no load).

(c) What are the losses that occur in a Transformer ?

(d) With reference to Induction Motors, what is slip ?

(e) With reference to alternators (synchronous generator), what is the significance of synchronous speed ?

(f) Perform the following conversions :

(i) $(25)_{10}$ to binary

(ii) $(1110)_2$ to decimal.

(g) For the NPN BJT shown in Figure 1, calculate (a) α, (b) I_c.

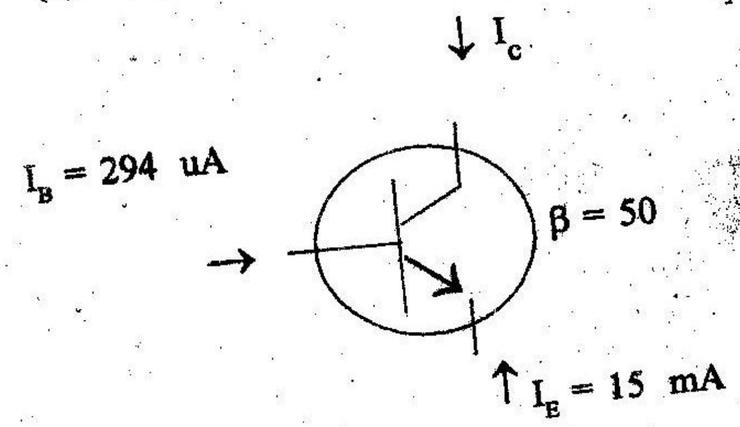

Fig. 1

3. Answer any *five* of the following questions : 5×4=20

(a) A 220V shunt connected DC Machine has an armature resistance of 0.5Ω. If full load armature current is 20A, find the induced emf when the machine acts as a

(i) generator

(ii) motor.

(b) Explain any method that can be used to control the speed of a shunt motor.

(c) A 3300V / 440V, single-phase transformer takes a no-load current of 0.8A and the iron loss is 500W. Draw the no-load phasor diagram and determine the values of the magnetizing and core loss components of the no-load current.

(d) How can a single phase induction motor be made self-starting ?

(e) State some application areas of Synchronous Motors.

(f) Verify the following Boolean expression using a truth table : $\overline{(A+B)} = \bar{A} \cdot \bar{B}$.

(g) For the circuit shown in Figure 2 with R1 = 1.6 kΩ and R2 = 1.4kΩ, calculate I_c and V_{CB}. Assume V_{BE} = 0.7V.

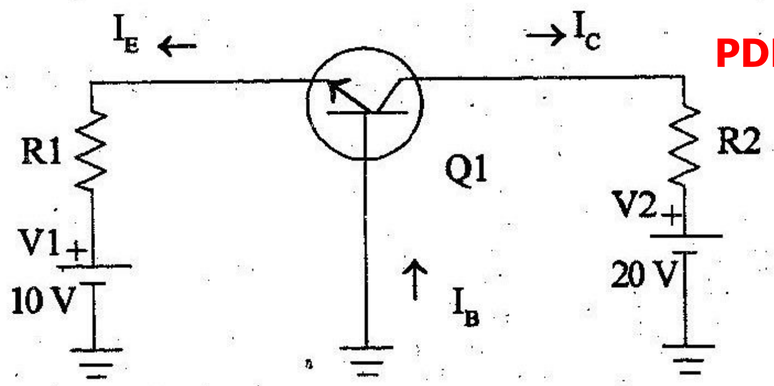

Fig. 2

4. Answer any *four* of the following questions : 4×5=20

(a) Explain the process of voltage build up of a DC Shunt Generator.

(b) A 230V DC Shunt Motor with armature resistance of 0.15Ω and field winding resistance of 250Ω, runs at 800 rpm and takes an armature current of 50A. Find the value of the resistance to be added to the field circuit to increase the speed to 1000 rpm at an armature current of 80A. Assume flux to be proportional to field current.

(c) A 20kVA, 3000/300 V transformer has an iron loss of 300W and full load copper loss of 400W. During the day it is loaded as follows :

Number of hours	Load	Power factor
8	1/4 of full load	0.8
9	3/4 of full load	0.6
6	Full load	1.0
1	No load	—

Calculate the all day efficiency.

(d) For a 4 pole, 3 phase induction motor operating from a supply with a frequency of 50 Hz, calculate :

(i) the speed at which the magnetic field of the stator is rotating

(ii) the speed of the rotor when slip is 0.04

(iii) frequency of the rotor current when slip is 0.03.

(e) Explain the significance of the coil span (or pitch) factor (k_p) and distribution (or breadth) factor (k_d) in the expression for induced emf of an alternator.

(f) Implement the following boolean expression using gates :

(i) $A.B + \bar{A}.\bar{B} + A.\bar{C}$

(ii) $A.B + \bar{C}.B.$

5. Answer any *three* of the following questions : 3×10=30

(a) Using neat diagrams (clearly showing current directions and voltage polarities) and relevant equations, list the different types of DC Generators. 10

(b) Describe the construction and working principle of a Three Phase Squirrel Cage Induction Motor. 10

(c) (i) Using a BJT in CE (Common-Emitter) configuration, explain the significance of the DC Operating or Q Point.

(ii) Implement the following boolean exprression using universal gates : A.B and A+B. 5+5=10

(d) (i) Define back or Counter EMF of DC Motor. Write its significance.

(ii) Explain the principle of operation of synchronous motor. 5+5=10