| BEE-031 |

DIPLOMA IN MECHANICAL ENGINEERING (DME)

Term-End Examination

ロロ6ア３   June, 2018

BEE-031 : ELECTRICAL TECHNOLOGY

Time : 2 hours   *Maximum Marks : 70*

Note : Attempt *five* questions in all, including question no. *1* which is *compulsory.* Use of calculator is permitted.

1. (a) Write *True* or *False* for the following statements :   7×1=7

    (i) Power factor for pure inductive circuit is one.

    (ii) In a shunt generator, the shunt field current is equal to the armature current.

    (iii) Voltage equation of a motor is given by $E_b = V + I_a r_a$.

    (iv) Copper loss = iron loss is the condition for maximum efficiency of transformer.

    (v) The torque developed in an induction motor is nearly proportional to V^2, where V is applied voltage.

    (vi) Synchronous motor does not require any external means for starting.

    (vii) Eddy current losses are proportional to square of frequency.

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(b) Fill in the blanks :   7×1=7

   (i) RMS value of e.m.f. is _____ times
       the maximum value of alternating
       e.m.f.

   (ii) Brushes of DC generator are made of

       _____ .

   (iii) Speed of DC motor is inversely
       proportional to _____ .

   (iv) In the transformer, Buchholz relay is
       placed between main tank and

       _____ .

   (v) CT and PT are called _____ .

   (vi) In case of three-phase Induction motor,
       value of slip (s) = _____ at the time
       of starting.

   (vii) Maximum speed of synchronous motor
       may be _____ if frequency is 50 Hz.

2. (a) Define the following :   8

   (i) Active power

   (ii) Form factor

   (iii) Passive element

   (iv) Power factor

(b) For the circuit shown in Figure 1, determine the current I through the 10 Ω resistance by nodal analysis.   6
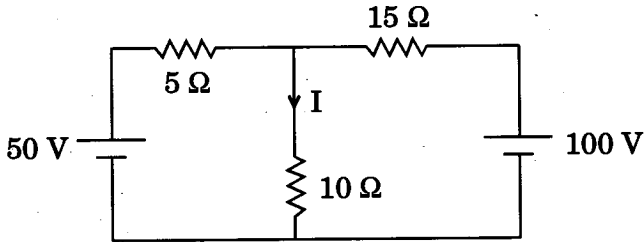
15 Ω

5 Ω

I

50 V   100 V

10 Ω

Figure 1

3. (a) State and prove Reciprocity theorem.   8

(b) Find the Thevenin's equivalent circuit at terminals AB for the circuit shown in Figure 2.   6
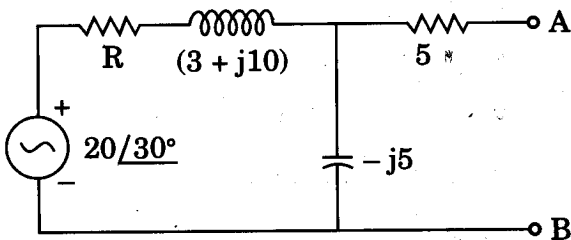
R   (3 + j10)   5

20/30°   − j5

A

B

Figure 2

4. (a) Derive the e.m.f. equation of a DC generator.   7

(b) Why is a starter necessary for DC motors ? Also draw Torque-Armature current characteristic of DC series motor.   7

5. (a) Explain construction and working operation of single-phase transformer. 7

(b) A 3300/300 V single-phase transformer gives 0.6 A and 60 watt as ammeter and wattmeter readings when supply is given to the low voltage winding and high voltage winding is kept open. Find 7

(i) power factor of no load current

(ii) magnetising current

6. (a) Explain working principle of three-phase induction motor. 7

(b) Describe different methods of speed control for three-phase induction motor. 7

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

(a) V-curve of Synchronous Motor

(b) Instrument Transformer

(c) Three Point Starter