BME-021

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING) / B.Tech. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

December, 2015

BME-021 : PRINCIPLES OF ELECTRICAL AND ELECTRONICS SCIENCE

Time : 3 hours *Maximum Marks : 70*

*Note : Answer **five** questions in all. Question no. **1** is **compulsory**. Answer any **two** questions from Section A and any **two** from Section B. Symbols and abbreviations have their usual meaning. Use of scientific calculator is allowed.*

1. State whether the following statements are *True* or *False* :   *7×2=14*

    (a) The specific resistance depends upon the area of cross-section of the conductor only.

    (b) The unit of magnetic field (B) is Wb/m².

(c) Norton's theorem is not applicable to a.c. circuits.

(d) The phase angle between voltage and current is 90° in case of purely resistive circuit.

(e) BJT can be used as switch.

(f) According to De Morgan's first theorem

$$\overline{A + B} = \overline{A} \cdot \overline{B}.$$

(g) The maximum data rates for RS-232 is 19·2 k baud or bits per second.

SECTION A

*Attempt any **two** questions from this section.*

2. (a) Explain the factors affecting the resistivity of conductors. What are the limitations of Ohm's law ? 7

   (b) A coil with 250 turns carries a current of 2 A, and produces a flux a of 0·3 mWb. When this current is reduced to zero in 2 milliseconds, the voltage induced in a nearby coil is 60 volts. Calculate (i) self-inductance of each coil, and (ii) mutual inductance between the coils. Assume coefficient of coupling = 0·7. 7

3. (a) State the Thevenin's theorem with the help of a suitable example. 7

   (b) Explain the principle of operation of a transformer and draw the equivalent circuit of a transformer referred to the secondary side. 7

4. (a) Explain the principle of operation of a three-phase induction motor. Also, derive the relation between rotor frequency and stator frequency. 7

(b) Find the (i) frequency of resonance, (ii) current and power factor at resonance, and (iii) Q-factor at resonance, for the circuit shown in Figure 1. 7
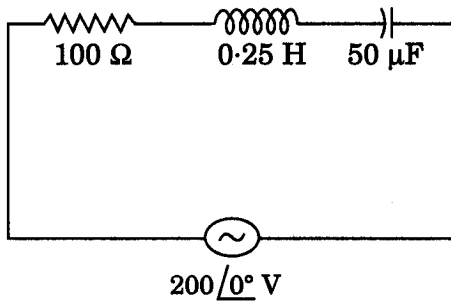

$100 \, \Omega$ $0.25 \, H$ $50 \, \mu F$

$200 \underline{/0°} \, V$

Figure 1

SECTION B

*Attempt any **two** questions from this section.*

5. (a) Explain the I – V characteristics of Zener diode and explain its working as a voltage regulator.   7

    (b) What is the full form of MODEM ? What are the basic functions of MODEM ?   7

6. (a) Draw the circuit diagram of an NPN junction transistor CE configuration and describe the static input and output characteristics.   7

    (b) Convert the following decimal numbers into binary :   7

        (i)   35

        (ii) 127

7. (a) Draw the block diagram of a computer and explain each block.   7

    (b) Write short notes on the following :   7

        (i)   TRIAC

        (ii) IGBT