BME-021

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING) / B.Tech. AEROSPACE ENGINEERING (BTAE)
Term-End Examination

01190

June, 2014

BME-021 : PRINCIPLES OF ELECTRICAL AND ELECTRONICS SCIENCES

Time : 3 hours   *Maximum Marks : 70*

Note : Answer **seven** questions in all. Question number 1 is **compulsory**. Attempt any three questions from Section A and any three questions from Section B. Use of scientific calculator is permitted.

1. State whether the following assertions are true or false :   *10×1=10*

    (i)   Conductor having high conductivity has high resistivity.

    (ii) A constant voltage source has zero internal resistance.

    (iii) Resistance of insulators increases with increase in temperature.

(iv) Kirchhoff's current law states that the vector sum of the currents meeting at a junction is zero.

(v) Reluctance is the property of a magnetic material that aids the passage of magnetic flux in it.

(vi) Piezo-electric effect is one in which an emf is produced when symmetrical crystalline materials are placed under stress.

(vii) A program counter points to the memory address from which the next machine code is to be collected.

(viii) An ideal OP-AMP possesses zero gain, zero input impedance and infinite output impedance.

(ix) ROM (Read Only Memory) is a non-volatile memory.

(x) A thyristor has low on-state voltage and an even smaller turn-on current.

SECTION A

*Answer any **three** questions from this section.*

2. (a) State and explain Norton's theorem. **5**

   (b) Find the current through the 2 Ω resistance in the network shown in Figure 1 using Thevenin's theorem. **5**
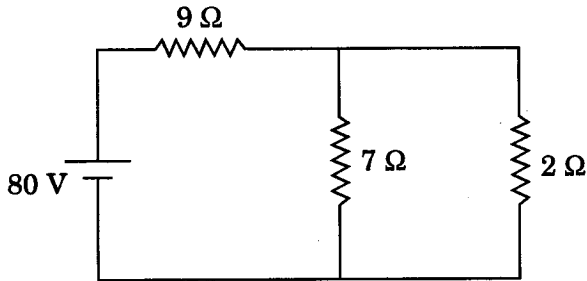
Figure 1

3. (a) Define cycle, time period, frequency, amplitude, phase and phase difference with reference to an a.c. waveform. **6**

   (b) A capacitor of 100 μF is connected in series with a coil of resistance 5 Ω and inductance 0·12 H. This combination is supplied by a 500 V, 50 Hz supply. Calculate

   (i) the rms value of the circuit current

   (ii) the power factor

   (iii) the voltage across the capacitor. **4**

4. (a) Explain magnetic hysteresis. *5*

   (b) A circular ring of mild steel has a diameter
   of 20 cm and a 2 mm side air gap. The
   cross-sectional area of the ring is $3 \cdot 2$ cm^2.
   Estimate the mmf required to establish a
   flux of $0 \cdot 6$ mWb. Assume relative
   permeability of mild steel equal to 900. *5*

5. (a) Compare star and delta connected systems. *5*

   (b) Three similar coils each of resistance 28 Ω
   and inductance $0 \cdot 1$ H are connected in star.
   If the supply voltage is 230 V, 50 Hz,
   calculate the line current and the total
   power absorbed. *5*

6. (a) Explain open circuit (O.C.) and short circuit
   (S.C.) tests on a transformer. What
   information do we get from these tests ? *6*

   (b) Write a brief note on operation of a
   universal motor. *4*

SECTION B

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

7. (a) Explain how an ADC (analog to digital converter) works.   *5*

    (b) Discuss the logical instructions used in a microprocessor with examples.   *5*

8. (a) Explain the I – V characteristics of a zener diode.   *5*

    (b) Describe the operation of a full wave bridge rectifier.   *5*

9. (a) Discuss the blocking operation of an IGBT.   *5*

    (b) What are the functions of counters ? What is the difference between synchronous and asynchronous counters ?   *5*

10. (a) State and expalin De-Morgan's theorems. Hence verify that A + BC = (A + B) (A + C).   *7*

    (b) Explain the 'AND' and 'OR' logic gates with truth table.   *3*

11. (a) Explain the use of 555 timer I.C. as a monostable multivibrator.   *5*

    (b) Discuss the working of SISO (serial in serial out) and SIPO (serial in parallel out) shift registers.   *5*