02584

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

June, 2010

BME-021 : PRINCIPLES OF ELECTRICAL AND ELECTRONICS SCIENCE

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **seven** questions. Question no. **1** is **compulsory**. Answer any **three** questions from **Section-A** and any **three** from **Section-B**. Symbols and abbreviations carry their usual meaning.*

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

(a) In 8085 Microprocessor, when MOVA, D instruction is executed, the register D still retains the original data.

(b) In RS-232, the logic voltages corresponding to logic 0 and 1 are reversed to avoid charge build-up on the lines.

(c) If the input to a digital buffer is logic 1, then the output would be logic 0.

(d) An astable multivibrator can be designed using an OP.AMP. as a comparator.

(e) A differential amplifier amplifies the difference between two input signals.

(f) The frequency of a periodic wave is inverse of its time period.

(g) If C_1, C_2, C_3 capacitors are connected in series, then $C_{Equivalent} = C_1 + C_2 + C_3$.

(h) In an induction motor the speed of the rotating magnetic field is slightly higher than the rotor speed.

(i) Reluctance of a magnetic circuit is directly proportional to its length and inversely proportional to its area of cross-section.

(j) Introduction of an air-gap in a magnetic circuit decreases its reluctance.

SECTION - A

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

2. (a) What is temperature coefficient α ? Give its units. How does the resistance of a metal conductor vary with temperature ? Give a mathematical expression showing change in resistance with change in temperature. **4**

(b) The tungsten filament of an electric bulb has a resistance of 50 ohms at 0°C. Find its resistance when it is lighted and attains a temperature of 2000°C; the temperature coefficient at 0°C, α_0 is 0.0045/°C. **6**

3. (a) State and explain Kirchhoff's current law. **4**

(b) In the circuit of Figure-1, V is 9 volts. Calculate the voltage V_a at node a using Kirchoff's current law. **6**

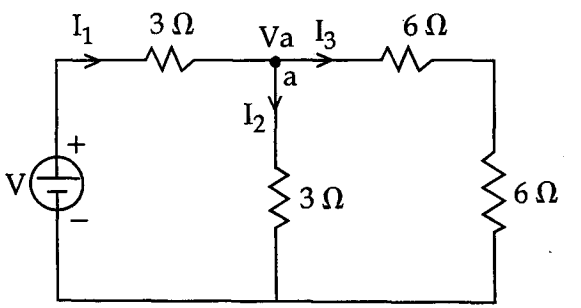

Figure - 1

4. (a) A pure capacitance C is connected in series with a resistance R, and the combination is connected across a voltage source V_s of Frequency f. Write an expression for the current in the circuit. Draw a vector diagram showing voltage drops across R and C, the resultant voltage and current. 5

(b) In the circuit of Figure-2, V_s is a 169 volt, 50 Hz source with complex impedance of the source as (5 $-$j 5) ohm. Calculate : 5

(i) the value of R_L for maximum power transfer to it.

(ii) the complex current I_L.

(iii) the magnitude $|I_L|$ of current.

(iv) P_{max} the maximum power transferred to load R_L.

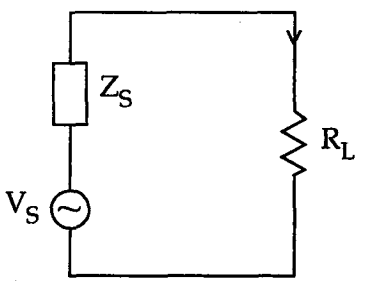

Figure - 2

5. (a) Briefly describe the terms as applied to magnetic circuits : flux density, magnetizing force, relative and absolute permeabilities, giving their units in M. K. S system. Give relation between MMF, S and ϕ in a magnetic circuit and draw analogy to an electric circuit. 4

(b) A magnetic circuit consists of an iron ring of mean circumference and cross-sectional area respectively of 80 cms and 12 cm^2. A current of 2 A in the magnetizing coil of 200 turns produces a total flux ϕ of (1.2×10^{-3}) Webers in the iron ring. Calculate : 6

(i) flux density B in the iron ring,

(ii) the absolute permeability μ,

(iii) relative permeability μ_r

(iv) reluctance of the magnetic circuit.

6. (a) Briefly describe : Speed control of induction motors. 2

(b) A 3-phase, 6-pole induction motor is connected to a 400 volt, 50 Hz supply. Calculate : 6

(i) the speed of rotation of the stator magnetic field,

(ii) the speed of the rotor when the slip is 5%,

(iii) the frequency of the rotor current,

(iv) the frequency of the rotor current at stand still.

(c) What are the different applications of a squirrel cage and wound-rotor induction motors. 2

SECTION - B

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

7. (a) Briefly describe any two . 3

   (i) S–R Flip Flop

   (ii) J–K Flip Flop

   (iii) D–Flip Flop

   (iv) T–Flip Flop

   (b) In which 4 ways can data be shifted in the shift registers. 2

   (c) Give the schematic diagram of a 3-stage ripple counter using T–Flip Flops and show timing signals at the Q_1, Q_2, Q_3 outputs with reference to the clock signal. The Q outputs toggle at negative transition of the clock. 5

8. (a) Briefly describe different busses of an 8085 microprocessor. 2

   (b) What are the different hardware interrupts in the 8085 microprocessor; give their priority. What interrupt is non-maskable. 3

   (c) What operations do the following 8085 microprocessor instructions perform ? (write about any five). 5

   (i) MOV C, B (ii) ADI F2H

   (iii) ORI 66H (iv) JMP 2050H

   (v) ANI 80H (vi) CMA

   (vii) XRA C (viii) HLT

   (ix) NOP

9. (a) What do α and β, in bipolar junction transistors, represent; derive an equation giving their relationship. 3

(b) Give the circuit schematic and gain equation of an I. C. operational amplifier in inverting configuration. 3

(c) Give the value of the feed-back resistance R_2 to obtain a gain of 20 dB, if $R_1 = 1\ k\Omega$ is connected between the signal input and the OP.AMP.'s inverting input. 4

10. Write short notes on ***any two*** of the following : 10

(a) TRIAC (b) MOSFET

(c) IGBT (d) Zener diode

11. (a) Give schematic diagram of an astable multivibrator using the 555 timer I. C. Show how external resistances R_A (connected between supply and pin 7), R_B (connected between pin 6 and pin 7) and external capacitor C (connected between pin 6 and ground) are used to obtain T_H (High) and T_L (Low) time periods for the generation of the output wave form. 4

(b) How would you generate a near square wave using the above timer I.C ? 2

(c) Calculate the value of the capacitor C, shown as above in the 555 timer, to generate a square wave of 5 kHz, if $R_A = R_B = 50\Omega$. 4