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BME-021

00583

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

B.Tech. (Aerospace Engineering)

Term-End Examination

December, 2010

BME-021 : PRINCIPLES OF ELECTRICAL AND ELECTRONICS SCIENCE

Time : 3 hours *Maximum Marks : 70*

Note : *Answer seven questions in all : Three questions from Section - A, three questions from Section - B, and the compulsory question number one.*

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1. State whether the following assertions are true or false : **10x1=10**

(a) An npn transistor can be used as switch.

(b) A p-n junction diode allows flow of current in one direction only.

(c) Bridge rectifier is a full-wave rectifier.

(d) A digital buffer does not give the same output as the input.

(e) A Flip-Flop can store more than one bit of information.

(f) When an 8085 MPU executes the instruction : MOV A, C ; the contents of register C are lost.

(g) If the gauge number of a wire is high, its diameter is small.

(h) Higher the permeability of a magnetic circuit, lower is its Reluctance.

(i) The current in a series resonant circuit is maximum at resonance.

(j) When two conductances of 2 mho each are connected in parallel, the total conductance is 4 mho.

SECTION - A

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

2. (a) State and briefly explain Kirchhoff's Voltage law. 5

(b) Find the currents I_1 and I_2 in the network of Figure - 1, using Kirchhoff's voltage law. 5

$V = 30$ volt

$R_1 = 3$ ohms

$R_2 = 3$ ohms

$R_3 = 6$ ohms

$R_4 = 6$ ohms

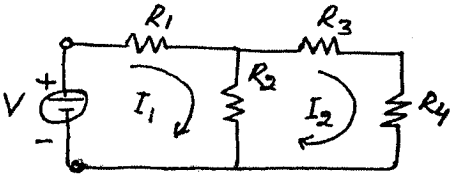

FIGURE 1

3. (a) A resistance R, capacitance C and inductance L are connected in series and excited with a voltage source $V_m \sin 2\pi$ ft. Give the condition at which the circuit would resonate and the resonance frequency. 3

(b) Draw vector diagram of current in the above circuit and voltage drops across the capacitor, inductor and the resistor. 3

(c) In the circuit of Figure - 2, find (i) the resonance frequency (ii) current at resonance : 4

V = 2 VOLT RMS

R = 1 ohms

L = 0.99 mH

C = 10 micro Farad

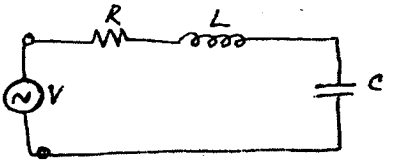

FIGURE 2

4. (a) Briefly describe the terms Magnetomotive Force, Flux, Reluctance as applied to a magnetic circuit giving analogy to electric circuit. Give relationship between these quantities and units in mks system, for each. 4

(b) A ring shaped magnetic circuit has three sections a, b and c with respective mean lengths $l_a = 30$ cms, $l_b = 20$ cms, $l_c = 10$ cms. An air-gap of 0.01 cm is cut in the ring. The relative permeabilities of a, b, c are 5000, 1000 and 10,000 respectively. Flux in Air-gap is 7.5×10^{-4} Wb. The coil has 100 turns. Find total reluctance, (ii) total MMF (iii) exciting current. 6

5. (a) Describe the working principle of a transformer. Show how the primary and secondary voltages and currents are related to primary and secondary turns ? What are different applications of transformer ? 5

(b) Two 3-phase induction motors, when connected across a 440 volt, 50 Hz supply are running at 1455 and 950 RPM respectively. Determine which of the two motors is running at a lower slip. 5

6. (a) What is specific resistance of a wire ? What is the resistance of a cylindrical wire element of length l, area of crossection A and specific resistance ? 5

(b) A resistance 10 ohm is connected in series with two resistances of 15 ohm each connected in parallel and the network connected across 30 volt supply. Give value of resistance that must be shunted across the parallel combination, so that the current in the network is 2 Amps. 5

SECTION - B

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

7. (a) Sketch the architecture of 8085 MPU and briefly describe the various sub units. 6

   (b) What would be crystal frequency to operate it at 1.2 MHz ? 2

   (c) What are HOLD and HLDA control signals and when are these used ? 2

8. (a) Describe briefly how a p-n junction is formed with p-type and n-type semiconductors ? How depletion layer is generated ? 4

   (b) What are the respective barrier potentials in germanium and silicon diodes ? 3

   (c) Show diagramatically how a p-n junction is (i) forward biased (ii) reverse biased. 3

9. (a) What are the characteristics of an ideal operational amplifier ? 2

   (b) Show how the amplifier is used as (i) an inverting amplifier (ii) as a non-inverting amplifier ? Give respective gain equations. 4

   (c) The value of feed-back resistance in the inverting configuration of an op. amp. is 100k ohm. A 10k ohm resistance is connected in the inverting input and a 50 millivolt positive d.c. signal is applied to it. Give the value of the output voltage. 4

10. (a) Show symbols and give truth tables of NOR and NAND logic gates. 4

(b) What are the different types of shift registers ? Give schematic of a three element serial input - serial output shift register using D-Flip Flops. 6

11. Write short notes on any two of the following : 5x2=10

(i) Semiconductor Memories

(ii) Use of an npn transistor as a common emitter amplifier.

(iii) Electronic counters

(iv) Use of a 555 timer I.C. as an Astable or Monostable multivibrator.