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BME-021

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

B.Tech. (Aerospace Engineering)

Term-End Examination

June, 2011

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 question number **one** is **compulsory**.*

1. State whether the following assertions are ***true*** or ***false*** : **1x10=10**

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

(b) A zener diode may be used as a voltage stabilizer.

(c) A 555 timer I.C. can not generate a square wave.

(d) A Flip-Flop output has only two stable states.

(e) The crystal frequency of a micro-computer designed using an 8085 MPU is twice the clock frequency.

(f) Greater the length of a magnetic circuit lower is its reluctance.

(g) When two capacitors 10 Micro Farad each are connected in parallel, the total capacitance is 5 Micro Farad.

(h) The current in a capacitor leads the applied voltage by 90°.

(i) Transformers make possible transmission of a.c. power over long distances.

(j) The current in a parallel resonant circuit is maximum at resonance.

SECTION - A

Attempt *three* questions from this section.

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

(b) In Figure-1, find the value of voltage V at node a, and currents I_1, I_2, I_3 using Kirchhoff's current law. 5
(Resistances are in ohms.)

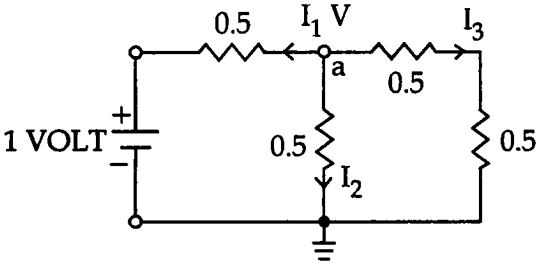

Figure - 1

3. (a) Show a series resonant circuit diagramatically and give conditions under which it would resonate. Also give the resonance frequency in terms of inductance L and capacitance C. 3

(b) Show phase relationship of current in the circuit and voltage drop across R, L and C. 3

(c) In the circuit of figure - 2, give. 4

(i) Value of capacitor C to give resonance

(ii) Current at resonance, I_0.

(iii) Q factor of the circuit.

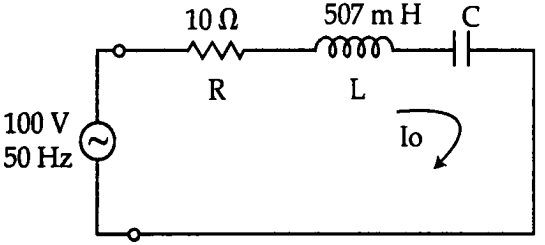

Figure - 2

4. (a) What is a hysterisis loop as applied to magnetic materials ? Describe ; how it is generated ? 4

(b) A ring has a mean diameter of 21 cms and a cross-sectional area of 10 cm^2. The ring is made up of semicircular sections of cast iron and cast steel ; with each joint having an air-gap of 0.2 mm. Find the ampere-turns required to produce a flux of 8×10^{-4} Wb. The relative permeabilities of cast iron and cast steel are 166 and 800 respectively. 6

5. (a) List the main components of a power transformer. What do you mean by step-up and step-down transformers. How a transformer is used in economic transmission of power ? 4

(b) A 4-pole, 3-phase induction motor operates from a supply whose frequency is 50 Hz. Calculate (i) the speed at which magnetic field of stator is rotating. (ii) the frequency of the rotor current when the slip is 0.03. (iii) the frequency of the rotor current at stand still. 6

6. (a) Give relationship between voltage V applied across a capacitor C and charge Q developed on it. Three capacitors C_1, C_2, C_3 are connected in series. Give equivalent capacitance C. 4

(b) The capacitors 10 μF, 20 μF and 30 μF are connected in parallel, calculate (i) Charge on each capacitor when the network is impressed with a 200 volt d.c. supply. (ii) Total capacitance of the network. 6

SECTION - B

Attempt *any three* questions from this section

7. (a) Give the architecture of 8085 microprocessor diagramatically and briefly describe its different subsystems. 6

   (b) When are the flags cr, s and z set. 2

   (c) What are the lowest priority and highest priority interrupts ? 2

8. (a) How an npn transistor is formed using n-type and p-type semiconductor materials ? 5

   (b) How are the two junctions in bijunction transistor biased for its operation ? 3

   (c) Give relationship between emitter current, collector current and base current in a BJT. 2

9. (a) Why is an operational amplifier called so ? What operations can it perform ? 2

   (b) Show how an operational amplifier can be used as a summing amplifier. 4

   (c) Give the circuit of an astable multivibrator using 555 timer I.C. 4

10. (a) Give symbols and Truth Tables of AND, and OR Logic gates. 4

    (b) What is the main difference between asynchronous (ripple) and synchronous counters ? Give scheme of a 4-element ripple counter using T-Flip Flops along with timing diagram at different outputs. 6

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

(a) Shift Registers

(b) Use of zener diode as a Voltage Regulator

(c) Use of an npn transistor as a common-base amplifier

(d) Flags in 8085 microprocessor