BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)
B.Tech. (Aerospace Engineering)
Term-End Examination
December, 2011 01762
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 **three** from section B. Symboles and abbreviations have their usual meaning. Use of calculator is allowed.*

1. State whether the following statements are ***True*** or ***False*** : **1x10=10**

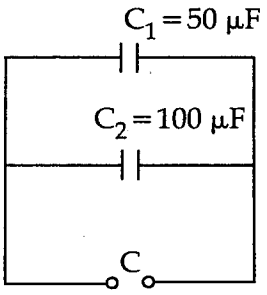
(a) The equivalent Resistance R of three resistances connected in parallel is given by

$$R = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_1 + R_2 + R_3}$$

(b) A non-linear resistor is one in which the current does not vary according to Ohm's law.

(c) When two coils are connected such that their fluxes are in opposite direction, the equivalent inductance is given by
$L = L_1 + L_2 + M$

(d) The total capacitance C of the following circuit is 150 μF.



(e) The rotating part of an induction motor is called armature.

(f) There is no field circuit in a Permanent Magnet DC Motor (PMDC).

(g) Diode and Transistor do not follow Ohm's law and are non-linear elements.

(h) Op-amp is used as astable multivibrator.

(i) De Morgan's First Theorem is

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

(j) SR - Flip-flop is used in counters.

SECTION-A

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

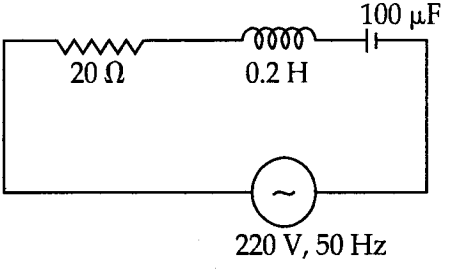
2. (a) Describe the effect of temperature on resistance. **5**

(b) A coil has a resistance of 15 Ω when its temperature is 20°C and 25 Ω when its temperature is 60°C. Find its temperature when the resistance is 20 Ω. **5**

3. (a) Develop the expression of self-inductance of a solenoid of length *l* metre, cross-section area A m^2 having N turns. **5**

(b) The steel pole piece of a permanent magnet has a cross-sectional area of 1.6×10^{-3} m^2. What is the flux density when the total flux in the pole piece is 1.35×10^{-3} Wb ? **5**

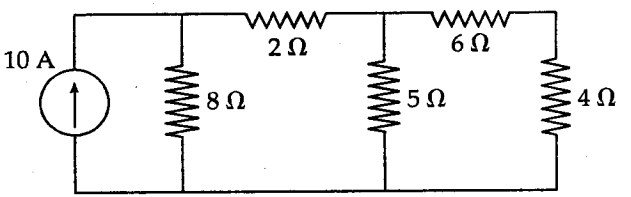
4. (a) For the circuit shown below, calculate the power consumed in watts. **6**



(b) Why do we neglect copper losses in open circuit test of a single phase transformer ? **4**

5. (a) Explain the Thevenin's Theorem. 4

(b) Calculate the current flowing through 5 Ω resistor in circuit using Norton's Theorem. 6



6. (a) What is a transformer ? Draw its labelled diagram and write the relation between input and output voltage and number of turns. 4

(b) A three phase squirrel cage induction motor is operating on 400V, 50Hz supply and is wound for 6 number of poles. What is the synchronous speed of rotating magnetic field in the air gap ? 6

SECTION - B

Answer *any three* questions from this section :

7.	(a)	Draw the symbol and write down the characteristics of MOSFET and SCR.	**6**
	(b)	Explain the operation of single phase half wave rectifier circuit and its waveform.	**4**
8.	(a)	Draw and explain OP Amp as an amplifier.	**5**
	(b)	Draw the symbol and truth table of : (i) AND (ii) OR Gate	**5**
9.	(a)	Explain with symbol and truth table the De Morgan's Theorems.	**6**
	(b)	Discuss the concept of Tristate.	**4**
10.	(a)	What is Flip-Flop ? Explain JK Flip-Flop with truth table.	**5**
	(b)	Explain the operation of any one type of Shift Register.	**5**
11.	(a)	Discuss the architecture and hardware aspects of 8085 microprocessor.	**5**
	(b)	Discuss the difference, similarity and applications of microprocessor, microcontroller and digital signal processor.	**5**