M00653

BME-021

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)/ B.Tech. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination,

December 2019

BME-021 : PRINCIPLES OF ELECTRICAL AND ELECTRONICS SCIENCE

Time : 3 Hours] *[Maximum Marks : 70*

*Note : (i) Answer **seven** questions in all.*

*(ii) Questions number **1** is **compulsory**.*

*(iii) Attempt **any three** questions from **section A** and **any three** questions from **section B**.*

(iv) Use of scientific calculator is permitted.

1. State whether the following statements are True (T) or False (F). 10×1=10

i) If the resistance of the conductor is small, current is also small.

ii) Insulator is also called as dielectric material.

iii) Unit of reluctance is Wb/AT.

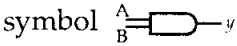
iv) An ideal constant voltage source has infinite internal resistance where as a constant current source has zero internal resistance.

v) The circuit where parameters change with voltage or current is called linear circuit.

vi) Total resistance of a parallel circuit is more than the smallest branch resistance.

vii) Full form of MOSFET is Metal-Oxide-Semiconductor Field Effect Transformer.

viii) SCR is MOSFET based device.

ix) The symbol  is for 'OR' GATE.

x) A bus is a group of conducting lines that carries data, address and control signals.

Section - A

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

2. a) Calculate the resistance of 100m length wire having a uniform cross-sectional area of $0.1mm^2$ if the wire is made up of a material having resistivity of 50×10^{-8} Ωm. 5

b) Find the effective resistance of the circuit shown in figure 1. 5

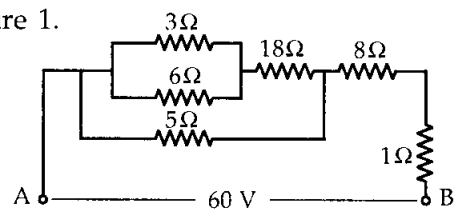


Figure 1

3. a) A coil of 100 turns is wound on a toroidal magnetic core having reluctance of 10^4 AT/Wb, when the coil current is 5 amp and is increasing at the rate of 2.00 Amp/sec. Determine. 5

i) Self inductance of coil

ii) Energy stored, and

iii) Self induced emf in coil.

b) Find the equivalent capacitance and charge across each capacitor for the following arrangement as shown in figure 2. 5

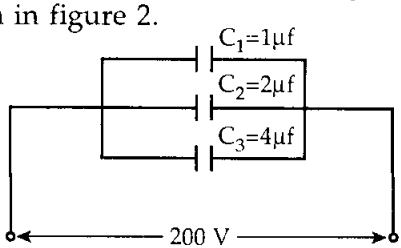


Figure 2

4. a) The equation of alternating current is given by $I = 50 \cos 100\Pi t$. Find : 5

   i) Frequency of a.c. applied.

   ii) Mean value of current during positive half of the cycle.

   iii) The value of current $\frac{1}{300}$ second after it was zero.

   b) State the Thevenin's theorem with the help of a suitable example. 5

5. a) What do you mean by impedance of LCR-circuit? Derive an expression for it. What is the condition for resonance? 5

   b) An alternate voltage $E = 200 \sin 300 t$. is applied a series combination of resistance of 10 Ω and an inductor of 800 mH. Calculate 5

   i) Impedance of the circuit

   ii) Peak value of the current in the circuit and

   iii) Power factor of the circuit.

6. a) A 6-pole, 50Hz, 3-phase induction motor running on full load develops a useful torque of 180 Nm when the rotor emf frequency is 2Hz. Calculate the shaft power output. If the mechanical torque lost in friction and heat for core loss is 12 Nm Calculate : 5

   i) The input to the motor and

   ii) Efficiency

   b) The total stator loss is 900W. What is transformer? Explain the working principle of a transformer. 5

Section - B

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

7. a) What are intrinsic and extrinsic semi conductor? Explain in brief the difference between p-type and n-type semiconductor. 5

   b) Draw and explain the electronic circuit of a common emitter amplifier using BJT. 5

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

   b) Explain the I-V characteristics of a Zener diode. 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) Explain the data bus, address bus and control bus in a typical microprocessor architecture. 5

    b) Describe the various registers of 8085. Name the 16-bit registers. Discuss the role of each register in mathematical operations. 5

11. a) Explain the operation of a Negative-Impedance Converter (NIC) using op-amp. 5

    b) Draw the small signal equivalent circuit of BJT and MOSFET. 5