FUNDAMENTAL OF ELECTRICAL & ELECTRONICS ENGINEERING

Time Allowed: 2.5 Hours *Full Marks: 60*

GROUP- A

1. Choose the correct answer from the given alternatives (any ten) 1 x 10 = 10

i. Rectifier is used to convert (a) DC signal to AC signal (b) AC signal to Pulsating DC signal (c) Reducing the amplitude of DC signal (d) Generation of AC signal

ii. The current through a series RLC circuit under resonance condition will be (a) V/R (b) V/X_C (c) V/X_L (d) none of these

iii. Transformer ratings are given in :a) kVA b) HP c) kVAR d) kW

iv. Two sinusoidal emfs are given as e1= Asin(ωt+π/4) and e2= Bsin(ωt-π/6). The phase difference between the two quantities in degrees is a) 15 b) 45 c) 75 d) 30.

v. For a DC voltage, an inductor (a) is virtually a short circuit. (b) is an open circuit. (c) Depends on polarity. (d) Depends on voltage value.

vi. The flux in transformer core a) increases with load, (b) decreases with load, (c) remains constant irrespective of load, d) none of the above.

vii. The number of valence electrons in the outermost shell of semiconductor are (a) 6 (b) 4 (c) 6 (d) 7.

viii. The potential barrier of a silicon diode is (a) 0.3 V (b) 0.7 V (c) 1 V (d) 5V.

ix. Which of the following does not change in a transformer? (a) Current (b) Voltage (c) Frequency (d) All of the above.

x. When two input of a NAND gate is high, the output of the gate will be (a) High (b) Low (c) Toggle between high & low (d) none of above

xi. In an auto-transformer, power is transferred, through a) Conduction process only (b) Induction process only (c) Both conduction and induction processes (d)Mutual coupling.

xii. The number of flip flops required in a decade counter is a) 2 (b) 3 (c) 4 (d) 10.

xiii. The maximum possible number of states in a ripple counter with 5 flip-flops is (a)32 (b) 15 (c) 10 (d) 5.

xiv. An ideal OP-AMP has the following characteristics- (Rin =input resistance, A= open loop gain, Rout= output resistance) a) Rin= ∞, A= ∞ and Rout = 0 b) Rin= 0, A= ∞ and Rout = 0 c) Rin= ∞, A= 0 and Rout = ∞ d) Rin= 0, A= ∞ and Rout = ∞.

xv. $\overline{\overline{A} + \overline{B}}$ is equivalent to a) A + B b) A.B c) $\overline{A}.\overline{B}$ d) $\overline{A} + \overline{B}$

2. Fill in the Blanks (any ten) 1x10 = 10

i. FET is a _____ controlled device

ii. Transformer cores are laminated in order to_____.

iii. The number of junctions in an NPN transistor are _____.

iv. Fleming's Left hand rule gives the direction of _____.

v. Conductance in Electric circuit is analogous to _____ in Magnetic Circuit.

vi. The CMRR of an OP-Amp is the ratio of _____.

vii. The majority charge carrier in n-type material is _____.

viii. Weber is the unit of _____.

ix. Energy is stored by the capacitor in the form of _____.

x. The time constant of a series R-C circuit is given by _____.

xi. If two capacitance of 10μF& 15 μF are connected in parallel then the equivalent capacitance will be_____μF.

xii. The output of AND gate will be HIGH only when both the input is _____.

xiii. The full form of TTL is _____,

xiv. A motor converts electrical energy into _____ energy.

xv. If the revers bias of gate in JFET is increased, the width of the conducting channel is _____.

3. Answer the following question in one or two sentences (any ten) : 1 x 10 = 10

i. Give two examples of insulating material.
ii. What is the frequency of a D.C signal?
iii. Define the term form factor.
iv. Calculate the time period of a periodic signal whose frequency is 60Hz.
v. Name the two input terminals of OP-AMP?
vi. What is a dependent Source?
vii. Draw the symbol of X-OR Gate.
viii. What is the unit of inductance?
ix. Why is doping done on Semiconductor?
x. Name any two types of Flip-Flop.
xi. Name one doping material for creation of N-Type Semiconductor.
xii. What are the types of Rectifier available?
xiii. On which principle the transformer works?
xiv. What is the unit of reactive Power?
xv. What type of DC Motor used in traction?

GROUP-B

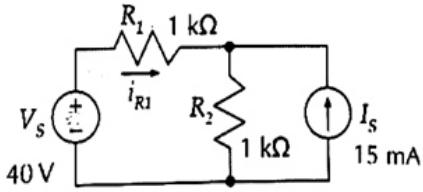
4. Answer the following question (any six) : 2 x 6 = 12

i. Define the term Semiconductor.
ii. Draw the symbol of PNP transistor with proper labeling of its terminals.
iii. Define Lenz's Law?
iv. What is an ideal current source?
v. What is mutual inductance?
vi. State Fleming's Right hand Rule?
vii. A 250V bulb passes a current of 0.3A. Calculate the power consumed by the lamp.
viii. Define the term Flip Flop?
ix. Define the term Virtual Ground.
x. Define the term Universal Gate.

GROUP-C

5. Module I :Answer the following Questions (any one) : 6 x 1 = 6

i) a) Draw the load current vs Load voltage curve of an ideal voltage source. b) Using Source transformation principle find out the current through the resistance R1. 2 + 4 = 6



ii) a) State Faraday's Laws of Electromagnetic Induction? b) Derive the expression for the energy stored in the magnetic field of an inductor. b) 2 + 4

iii) A rectangular shape iron core has an air gap of 0.01cm. The mean length of the flux path through iron is 39.99 cm. The relative permeability of iron is 2000. The coil has 1000 turns. The cross-sectional area of the core is 9 cm^2. Calculate the current required to produce a flux of 1mWb in the core. 6

6. Module II :Answer the following Questions (any one) : 6 x 1 = 6

i) A R-L-C series circuit comprises of resistance of 15 Ω inductance 0.15 H and capacitance of 100 μF is connected across a 230V, 50 Hz supply. Calculate current, power factor and power consumed by the circuit. 6

ii) a) Show that the current leads the voltage in phase by $\pi/2$ in an a.c. circuit containing an ideal capacitor. b) Draw STAR & DELTA connections. Also write voltage and current relations for both types. 6

iii) a) A 30 KVA single phase transformer has 500 primary turns and 30 secondary turns. The primary is connected to a 3300V, 50 Hz single phase supply. Calculate i) the maximum flux in the core; ii) secondary e.m.f; iii) primary and secondary full load current. b) Name different types of DC motors. 4 + 2 = 6

7. Module III :Answer the following Questions (any one) : 6 x 1 = 6

i) With respect to Energy band diagram differentiate between Conductors, Semiconductor & Insulator. 6

ii) Draw the circuit diagram of an inverting amplifier & Derive the expression for output voltage. 6

iii) a) State the two laws De Morgan's Theorem along with the truth table. simplify the expression using Boolean algebra and realize the same by using logic gates. $Y = (A + \overline{B} + \overline{C}).(A + \overline{B}\ C)$ 3 + 3 = 6