203(N)

FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING

Time Allowed: 4 Hours | Full Marks: 80

Answer to Question No. 1 of Group A must be written in the main answer script. In Question No. 1, out of 2 marks for each MCQ, 1 marks is allotted for right answer and 1 marks is allotted for correct explanation of the answer. However, no marks will be given for wrong explanation of the answer of each MCQ type question.
Answer any Five (05) Questions from Group-B.

GROUP-A

1 Choose the correct answer from the given alternatives and explain your answer (any ten): 2x10=20

i An ideal current source has (a) zero internal resistance (b) infinite internal resistance (c) low value of voltage (d) large value of current.

ii The resistance of a conductor increases if its (a) length increases (b) area of cross-section increases (c) length as well as area of cross-section increases (d) value of specific resistance is kept constant.

iii. Energy stored by a coil is doubled when its current is increased by percent (a) 25 (b) 50.5 (c) 41.4 (d) 100.

iv. A coil with 500 turns carries a current of 2 A. The value of MMF of the coil is (a) 20 AT (b) 200 AT (c) 1000 AT (d) 55 AT

v Inductive reactance of a coil of inductance 0.2 H at 50 Hz is (a) 62.8 Ω (b) 628 Ω (c) 0.2 Ω (d) 10Ω

vi. The power factor of a purely resistive circuit is (a) zero (b) unity (c) lagging (d) leading.

vii. A sinusoidal voltage is represented by v = 141.4 sin (314.18π/2). Its rms value of voltage is (a) 141.4 V (b) 100 V (c) 87.92 V (d) 200 V.

viii. Voltage per turn in both primary and secondary windings of a transformer is (a) high in high voltage winding (b) low in low voltage winding (c) same (d) can't be determined.

ix. Transformer rating are given in (a) KVA (b) HP (c) KVAR (d) kW

x. A transformer transforms, a) Power b) Voltage c) current d) frequency

xi. When PN junction diode is in forward bias, by increasing the battery voltage (a) Circuit resistance increases (b) Current through P-N junction increases (c) Current through P-N junction decreases (d) None of the above happens.

xii. An ideal OPAMP is an ideal (a) current controlled current source (b) current controlled voltage source (c) voltage controlled voltage source (d) voltage controlled current source

xiii. When the 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 the above

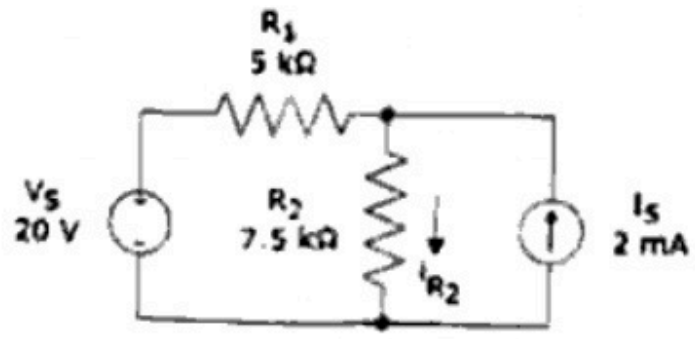
xiv. A diode is a/an (a) bidirectional device (b) unidirectional device (c) both (a) and (b) (d) none of the above

xv. Which of these sets of logic gates are known as universal gates? (a) XOR, NAND, OR (b) OR, NOT, XOR (c) NOR, NAND, XNOR (d) NOR, NAND

GROUP-B

Answer any Five (05) questions. 8x5

2. (a) Write the unit of resistivity. Name the factors affecting the resistance of a conductor.
(b) Using source transformation, find out the current through the resistance R_2 in the figure below.



3 (a) Define Magnetic Flux Density and MMF
(b) State Faraday's Laws of Electromagnetic Induction 1+2+5

4 (a) Draw and explain hysteresis loop for magnetic material.
(b) Discuss the causes of hysteresis loss. 4+2

5 (a) For sinusoidally varying alternating quantity, state the relation between (i) rms value and maximum value, (ii) average value and maximum value.
(b) Show that current in a pure inductive circuit lags the voltage by 90 degree.
(c) Define active power and reactive power. 2+4+2

6 A coil of resistance 20 Ω and inductance 100 mH is connected in series with a capacitance of 40 μF across 100 V, 50 Hz ac supply. Calculate (i) the magnitude of current, (ii) power factor, (iii) phase angle between voltage and current, (iv) voltage across each element. 2+2+2+2

7 (a) Derive the emf equation of a transformer.
(b) A single phase transformer is required to step down the voltage from 1100 V to 400 V at 50 Hz. The core has a cross-sectional area of 25 cm^2 and the maximum flux density is 5 Wb/m^2. Determine the number of turns of the primary and secondary windings. 4+4

8. (a) With respect to Energy band diagram differentiate between Conductors, Semiconductor & Insulator.
(b) Distinguish between an intrinsic and extrinsic semiconductor material. 6+2

9. (a) Draw the circuit diagram of an op-amp non-inverting amplifier and derive the expression for output voltage
(b) Draw the pin diagram of IC 741 OPAMP. 5+3

10 (a) State De-Morgan's Theorem.
(b) Draw the logic symbol and truth table of a 2-input NAND gate and EX-OR gate. 2+3+3