

National Institute of Technology, Delhi

Name of the Examination: B. Tech.

Branch : EEE and ECE. Semester : 1st
 Title of the Course : Introduction to Electrical & Electronics Engineering Course Code : EEB100

Time: 3 Hours

Maximum Marks: 50

- Note : 1. Do not write anything on the question paper except Roll number
 2. Assume any data suitably if found missing

Section A: Answer all 10 multiple choice questions. Each question carries 01 mark. [10×1=10]

- A1.** A current of 2 A flows for 10 hours through a 100Ω resistor. The energy consumed by the resistor is
 (a) 0.5 kWh (b) 4 kWh (c) 2 kWh (d) 0.02 kWh
- A2.** A sinusoidal current has a magnitude of 3 A at 120° . Its maximum value will be
 (a) $\sqrt{3}$ A (b) $\frac{\sqrt{3}}{2}$ A (c) $2\sqrt{3}$ A (d) 6 A
- A3.** The peak factor of a half wave rectified sine wave is
 (a) 1.57 (b) 2 (c) 1.11 (d) 1.4142
- A4.** In a full wave rectifier, the diodes conduct for
 (a) One half cycle (b) full cycle (c) alternate half cycle (d) none
- A5.** The element that has the biggest size in a transistor is
 (a) base (b) emitter (c) collector (d) none
- A6.** The base of a transistor is _____ doped
 (a) lightly (b) moderately (c) heavily (d) none
- A7.** A transformer transforms
 (a) frequency (b) voltage (c) current (d) voltage and current
- A8.** A transformer having 1000 primary turns is connected to a 250V ac supply. For a secondary voltage of 400V, the number of secondary turns should be
 (a) 1600 (b) 250 (c) 400 (d) 1250
- A9.** The number 100101_2 is equivalent to octal
 (a) 54 (b) 45 (c) 37 (d) 25

P.T.O

A10. A J-K flipflop with $J=1$ and $K=1$ has a 10 kHz clock input. The $Q=\text{output}$ is

- (a) Constantly LOW
- (b) Constantly HIGH
- (c) 5 kHz square wave
- (d) 10 kHz square wave

Section B: Answer any 4 questions. Each question carries 5 marks.

[4×5=20]

B1. Convert the following numbers

- (a) 357_8 to decimal
- (b) 6421_8 to decimal
- (c) 1359_{10} to octal
- (d) 2735_{10} to hexadecimal
- (e) $7AF4_{16}$ to binary

B2. Simplify the following expression using the K-Map

$$X = \overline{A}\overline{B}\overline{C}D + \overline{A}\overline{B}CD + \overline{A}B\overline{C}D + A\overline{B}\overline{C}D + A\overline{B}CD + ABCD.$$

B3. Explain the working of bridge rectifier with the help of neat circuit diagram.

B4. A voltage $v=200\sin 314t$ is applied to the transformer winding at no load. The resulting current is found to be $i=3\sin(314t-60^\circ)$. Determine the core loss and the parameters of the no-load approximate equivalent circuit (I_w, I_μ, R_0, X_0).

B5. Explain the working of single phase ac generator.

Section C: Answer any 2 questions. Each question carries 10 marks.

[2×10=20]

C1. (a) Implement NOT gate, OR gate, AND gate, NOR gate and EX-OR gate using NAND gate.

(b) Implement NOT gate, OR gate, AND gate, NAND gate and EX-OR gate using NOR gate.

C2. A $50\text{ kVA}, 4400/220\text{ V}$ transformer has $R_1=3.45\Omega, R_2=0.009\Omega$. The values of reactance's are $X_1=5.2\Omega$ and $X_2=0.015\Omega$. Calculate for the transformer (i) equivalent resistance as referred to both primary and secondary, (ii) equivalent reactance as referred to both primary and secondary, (iii) equivalent impedance as referred to both primary and secondary, (iv) total copper loss, first using individual resistances of two windings and secondly using equivalent resistances as referred to each side.

C3. Current of 7.5 A flows through a non inductive resistance in series with a choke coil when connected to supply of $230\text{ V}, 50\text{ Hz}$. If the voltage across the resistance is 110 V and across the coil is 180 V , calculate (i) resistance, reactance and impedance of the choke coil, (b) total resistance and impedance of the circuit, (iii) power absorbed by the coil, (iv) total power drawn by the circuit, and (v) power factor of the whole circuit.