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Bihar Engineering University, Patna
B.Tech. 2nd Semester Special Examination, 2024

Course: B.Tech.
Code: 100201

Subject: Basic Electrical Engineering

Time: 03 Hours
Full Marks: 70

Instructions:-

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

Q.1 Choose the correct answer of the following (any seven question only): **[2 x 7 = 14]**

- (a) Which of the following elements of electrical engineering can not be analyzed using Ohm's law?
(i) Capacitors (ii) Inductors (iii) Transistors (iv) Resistor
- (b) Which of the following is a correct representation of peak value in an AC Circuit?
(i) RMS Value/Peak Value (ii) RMS Value x form factor
(ii) RMS Value/form factor (iv) RMS Value x Peak factor
- (c) What is the number of primary turns in a 200/1000 V transformer if the emf per turn is 10 V?
(i) 5 (ii) 10 (iii) 20 (iv) 40
- (d) If a circuit does not contain any source of energy or emf, it is known as
(i) Unilateral circuit (ii) Bilateral Circuit
(iii) Passive network (iv) Active network
- (e) The rotor slots in a 3-phase induction motor are kept inclined. This phenomenon is known as
(i) Skewing (ii) Crawling (iii) Cogging (iv) hardening
- (f) How many cycles will an AC signal make in 2 seconds if its frequency is 100 Hz?
(i) 50 (ii) 100 (iii) 150 (iv) 200
- (g) For domestic wiring purpose, how are circuits connected?
(i) Straight (ii) Series (iii) Parallel (iv) Serial
- (h) Lamps in street lighting are all connected in
(i) Series (ii) Parallel (iii) Series- parallel (iv) end-end
- (i) The time constant for an RC circuit is
(i) $1/RC$ (ii) R/C (iii) $1/(RC)^2$ (iv) RC
- (j) A circuit breaker is
(i) Power factor correcting device
(ii) A device to neutralize the effect of transients
(iii) A waveform correcting device
(iv) A current interrupting device

Q.2 (a) State and explain Kirchoff's laws with suitable examples and Circuit diagram. **[7]**

(b) State and prove Maximum Power Transfer Theorem. **[7]**

Q.3 (a) Explain the procedure of Thevenin's theorem and Norton's theorem to simplify any complex DC Circuit. What are the similarities and dissimilarities between these two theorems? **[6]**

(b) Explain with proper examples:- **[8]**
(i) Linear & Non-linear circuits
(ii) Active & Passive circuits
(iii) Unilateral & Bilateral circuits
(iv) Lumped & Distributed Circuits

- Q.4** (a) Derive an expression for RMS values of sine wave form. [7]
(b) Derive an expression for the current and impedance for a series RL and RC circuit excited by a Sinusoidally alternating voltage. Draw the phasor diagrams. [7]
- Q.5** (a) How to control the speed of D.C. Shunt motor. Explain it with any one example. [7]
(b) Explain the Constructional details of D.C. machine with neat sketch. [7]
- Q.6** (a) A 4Ω resistor is connected to a 10 mH inductor across a 100 V, 50 Hz voltage source. Find the (i) impedance of the circuit (ii) input current (iii) voltage drop across the resistor and inductor (iv) powerfactor of the circuit (v) real power consumed in the circuit and (vi) total power supplied. [7]
(b) A series RL-C circuit has inductance of 10 mH and resistance of 2Ω . What is the value of capacitance that will produce resonance? Also find the current at resonance frequency and maximum instantaneous energy stored in the inductance at resonance, Assume the supply as 230 V, 10000 Hz sinusoidal. [7]
- Q.7** (a) Define Wiring system & List the types of wiring systems. [7]
(b) List the advantages & disadvantages of Conduit wiring. What is the necessity of Earthing? [7]
- Q.8** (a) Draw the constructional diagram of a single-phase transformer and explain all the parts. [7]
(b) Derive an EMF equation of a single-phase transformer. Also explain Voltage Regulation & Efficiency. [7]
- Q.9** Write short notes on *any two* of the following:- [7x2=14]
(a) Admittance and impedance
(b) Application of MCB, ELCB & MCCB
(c) Power factor improvement
(d) Various types of D.C. Generator

