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10EE15/25

B. E. Degree First Semester End Examination (SEE), December 2010

BASIC ELECTRICAL ENGINEERING

(Model Question Paper – 1)

Time: 3 Hours] **[Maximum Marks: 100**

Note:
1. **Answer FIVE FULL questions.**
2. **Question No. 1, 2 and 3 are COMPULSORY**
3. **Answer ANY ONE from Question No. 4 and 5**
4. **Answer ANY ONE from Question No. 6 and 7**

1. Choose the correct answer (20 x 1 Mark Each)

i) Validity of ohm's law requires a constant _.

(A) Voltage (B) Resistor (C) Current (D) Power

ii) The power factor of pure resistive circuit is

(A) Zero (B) Unity (C) Lagging (D) Leading

iii) The algebraic sum of instantaneous phase current in a 3 phase balanced system is equal

(A)Zero (B) Infinity (C) Line current (D) Phase current

iv) In a dynamometer wattmeter the fixed coil is also known as

(A) Potential coil (B) current coil (C) power factor coil (D) power coil

v) The back emf of a motor at the moment of starting is equal

(A) Zero (B) applied voltage

(C) 2% of the applied voltage (D) 50% of the applied voltage

vi) The core of transformer is laminated to reduce

(A) eddy current loss (B) Hysteresis loss (C) copper loss (D) Friction loss

vii) The condition for maximum efficiency in transformer is

(A) Iron loss=Cu loss (B) Iron loss=0 (C) Cu loss=0 (D) Iron loss=2xCu loss

viii) An induction motor is

(A) A DC shunt machine (B) An asynchronous Machine

(C) Synchronous Machine (D) Separately excited DC Machine

ix) An alternator is also known as

(A) Asynchronous generator (B) Synchronous generator

(C) Asynchronous motor (D) Synchronous motor

x) Synchronous speed of 3 phase Induction motor is given by

(A) Ns=120f/p (B) Ns=120p/f (C) Ns=120fp (D) Ns=fp/120

xi) The unit of magnetic field density B is

(A) henry (B) ampere turns/meter (C) webers (D) tesla

xii) Charcoal and salt are used in Earthing to

(A) increase soil conductivity (B) decrease soil conductivity

(C) make soil hard (D) make soil soft

xiii) The relationship between line and phase voltage of a Δ connected circuit is

(A) $V_L=V_P$ (B) $V_L=\sqrt{3}V_P$ (C) $V_L=V_P/2$ (D) $V_L=2V_P/\pi$

xiv) If the readings of two wattmeters, used to measure 3 phase power , are equal the Power factor of the circuit is

(A) 0.8 lagging (B) 0.8 leading (C) 0 (D) 1

xv) Turbo Alternators generally have

(A) Salient pole type rotor (B) Non-salient pole type rotor

(C) Salient pole type armature (D) Cage type rotor

xvi) Carbon brushes are preferable to copper brushes because

(A) they have long life (B) they reduce armature reaction

(C) they have lower resistance (D) they reduce sparking

xvii) Series DC motors have

(A) high starting torque (B) no starting torque

(C) low starting torque (D) low speed

xviii) In energy meter ,moving system attains the steady speed when

(A) Braking torque is zero (B) Braking torque is maximum

(C) Braking torque is equal to operating torque (D) Operating torque is constant

xix) Short pitched windings in alternators

(A) increase machine rating (B) improve generated voltage

(C) improves wave shape (D) All of the above

xx) The slip of an Induction motor at stand still is

(A) 0 (B) 1 (C) infinity (d) 0.5

2. **(a)** State and Explain: (i) Flemings left hand rule (ii) Flemings right hand rule **(4 Marks)**

(b) Two coils, X having 12,000 turns and Y having 15,000 turns lie in parallel planes such that 45% of the flux produced by coil X links coil Y. A current of 5A in X produces 0.05mwb, while the same current in Y produces 0.075mWb. Calculate (i) The mutual inductance and (ii) the coupling coefficient. **(6 Marks)**

(c) A coil consists of 600 turns & a current of 10A in the coil gives rise to a magnetic flux of 1mωb. Calculate (i) self inductance (ii) emf induced (iii) energy stored when the current is reversed in 0.01 sec. **(6 Marks)**

(d) Show that power dissipated by a pure inductance is zero. **(4 Marks)**

3. **(a)** Obtain the relationship between line voltage and phase voltage in a balanced Delta Connected system. **(5 Marks)**

(b) Mention the advantages of 3 phase systems over single phase systems. **(4 Marks)**

(c) A series circuit with R=10ohms, L=50mH and C=100 micro-farad is supplied with 200V, 50Hz. Find the (i) Impedance (ii) Current (iii) Power (iv) Power factor. Also draw the vector diagram. **(5 Marks)**

(d) A balanced star connected load of (8+j6) ohms /phase is connected to a 3 phase, 230V

supply. Find the (i) Line current (ii) Power factor (iii) Real power (iv) Reactive power **(6 Marks)**

4. **(a)** Derive a condition for maximum efficiency in case of transformers. **(5 Marks)**

(b) Explain the production of torque in a 3-phase induction motor. **(5 Marks)**

(c) The frequency of the emf in the stator of a 4 pole induction motor is 50 Hz & in the rotor is 1.5Hz. What is the slip & What speed is the motor running. **(4 Marks)**

(d) In a 25 kVA, 2000/200V transformer the iron & copper losses are 350W & 400W respectively. Calculate the efficiency at upf at half full load & find the copper loss at this load. **(6 Marks)**

OR

5. (a) Derive emf equation of single phase transformer. **(5 Marks)**

(b) A 50 kVA transformer has an efficiency of 98% at Full load, 0.8 pf & an efficiency of 96.9% at ¼ Full load, upf. Determine Iron loss & copper loss. **(6 Marks)**

(c) Explain the construction of squirrel cage & phase wound Induction motor. **(5 Marks)**

(d) A 3 phase , 6 pole ,60Hz, Induction motor has rotor current frequency of 1.8 Hz at Full load. Find the synchronous speed & slip at Full load. **(4 Marks)**

6. (a) Mention the advantages of having stationary armature & rotating field system in a synchronous generator. **(5 Marks)**

(b) Derive an expression for Torque in D.C motors. **(5 Marks)**

(c) A 12 pole, 500 rpm star connected alternator has 48 slots with 15 conductors / slot. The flux/pole is 0.02wb & is distributed sinusoidally. The winding factor is 0.97. Calculate line emf. **(5 Marks)**

(d) A 4 pole, 1500 rpm DC generator has lap wound armature having 24 slots with 10 conductors/slot. If flux/pole is 0.04wb, calculate the emf generated. What would be the generated emf if the winding is wave connected? **(5 Marks)**

OR

7. (a) Derive emf equation of 3phase Alternator. **(5 Marks)**

(b) Explain the working principle of D.C motor. **(5 Marks)**

(c) A 230V, DC series motor has an armature circuit resistance of 0.2 ohm & series field resistance of 0.1 ohm. At rated voltage, the motor draws a line current of 40 A and runs at a speed of 1000rpm.Find the speed of motor for a line current of 20A at 230V. Assume that flux at 20A line current is 60% of the flux at 40A line current. **(10 Marks)**

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