Total No. of printed pages = 6

EI-304/EEE/3rd Sem/2017/N

ELEMENTS OF ELECTRICAL ENGINEERING

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

PART – A

Marks – 25

Time – One hour

Answer *all* the questions.

1. Multiple choice questions : 1×5=5

   (a) The rate of doing work is called

   (i) Power (ii) Work done

   (iii) Energy

   (b) A storage battery is an example of

   (i) Thermal effect (ii) Magnetic effect

   (iii) Chemical effect.

[Turn over

(c) How many electrical degree make one cycle ?

(i) 270° (ii) 120°

(iii) 180° (iv) 360°

(d) Ohmic value of inductive coil is called

(i) Impedance

(ii) Capacitive reactance

(iii) Inductive reactance

(e) Specific gravity of a fully charged battery is

(i) 1340 (ii) 1120

(iii) 1280 (iv) 1240

2. Fill in the blanks : $1 \times 5 = 5$

(a) Transformer is always rated in _____.

(b) The P. f of a purely capacitive circuit is _____.

(c) The difference between synchronous speed and actual speed is called _____.

(d) The ratio of RMS value to the average value is called _____.

(e) The induced voltage in case of an electric D.C motor is called _____.

3. State true or false : 1×5=5

(a) In starting motor does not have any back emf.

(b) The back emf is $E_b = (V - I_a . R_a)$.

(c) The rotating magnetic field is called actual speed.

(d) The ratio of resistance by inductance is called impedance.

(e) The algebraic sum of current meeting at a point is zero.

4. Answer the questions in one word each : 1×5=5

(a) The capacity for doing work is called what ?

(b) Time taken to complete one cycle is called what ?

(c) Is it advisable to start a D.C series motor without load ?

(d) The ratio of true power by apparent power is called what ?

(e) Open circuit test of a transformer is done to measure what ?

5. Match the following questions : 1×5=5

(a)	The electric motor always rated	(a) KVA
(b)	Resistance of line insulator is measured in	(b) H.P
(c)	The practical unit of electrical energy	(c) Ahr.
(d)	The transformer is always rated in	(d) kWh
(e)	Capacity of a Lead-acid battery is	(e) MΩ

PART – B

Marks – 45

Time – Two hours

Answer any *five* questions.

6. (a) Define with their units : Power and Energy.

(b) Deduce the relation of 1kWh = 860 Kcal. 4+5=9

7. (a) Define and explain Kirchhoff's laws.

(b) A wheatstone bridge ABCD is arranged as follows :

arm AB = 1Ω, BC = 2Ω, CD = 3Ω, DA = 4Ω respectively.

A resistance of 5Ω is connected between B and D. A 4V battery of internal resistance 1Ω is connected between A and C. Calculate (i) the magnitude and direction of current in 5Ω resistor (ii) the resistance between A and C. 4+5=9

8. (a) Write down the difference between primary and secondary cell.

(b) What are the active materials of a lead acid battery ?

(c) Define the back emf of a DC motor. 2×3=6

(d) Name the different types of DC generator with their symbolic diagram . 3

9. (a) Deduce the emf equation Transformer .

(b) Define the principle of DC generator.

(c) A short shunt compound generator delivers a load current of 30A at 220V and has armature, series field and shunt field resistances of 0.05Ω, 0.30Ω and 200Ω respectively. Calculate the induced emf and the armature current. Allow 1.0V per brush for contact drop. 3+2+4=9

10. (a) Define RMS value. 2+2+5=9

(b) Define time period of an alternating quantity.

(c) An emf is given by 170 Sin 377t. Determine its (i) RMS value (ii) frequency (iii) maximum value.

11. (a) Define power factor. 2+2+5=9

(b) What is the current and voltage relationship in RC series circuit ?

(c) A coil having a resistance of 7Ω and an inductance of 31.8 mH is connected to 230V, 50Hz supply. Calculate (i) the circuit current (ii) phase angle (iii) power factor and (iv) power consumed.

12. Write a short notes on any *three* : 3×3=9

(a) Series RLC circuit.

(b) Principle of induction.

(c) Auto-transformer.

(d) Lead-acid cell .