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(Pages : 4)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

First and Second Semester

EN 010 108—BASIC ELECTRICAL ENGINEERING

(New Scheme—2010 Admissions onwards)

[Regular/Improvement/Supplementary]

[Common for all Branches]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 marks.

1. Define : (a) Magnetic force ; (b) Magnetic reluctance ; and (c) Relative permeability.
2. Define the term coefficient of coupling and write and expression for it.
3. Show that the voltage induced in a transformer per turn is the same whether it is primary or secondary.
4. What are 3-wire and 4-wire systems ? Explain with examples.
5. Explain the working principle of mercury vapour lamp.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 marks.

6. Find the current through the 10Ω resistor in the network of Fig. 1. by Mesh method.

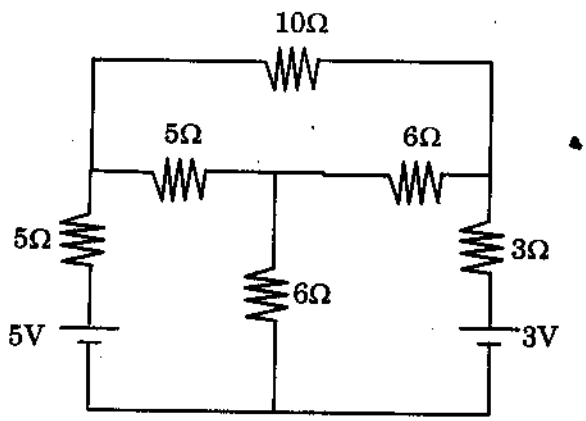

Fig. 1

Turn over

7. An impedance of $4 + 7j\,\Omega$ is connected in parallel with a resistance of 10Ω. Find the ratio of power loss in these parallel circuits.

8. What do you mean by back e.m.f. ? Explain its significance.

9. A balanced delta connected load $z = 2 + j\,7\,\Omega$ is supplied from a 3-phase, 3-wire, 100 V system. Calculate the line currents when one of the lines is opened ?

10. What is power quality ? List and briefly explain any *three* factors to improve power quality.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Obtain the currents through each of the sources and their respective power dissipation in the network of Fig. 2.

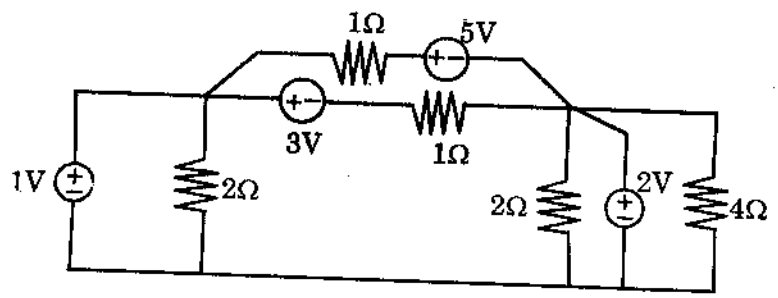

Fig. 2

Or

12. Develop nodal equation of the circuit shown in Fig. 3, in matrix form :

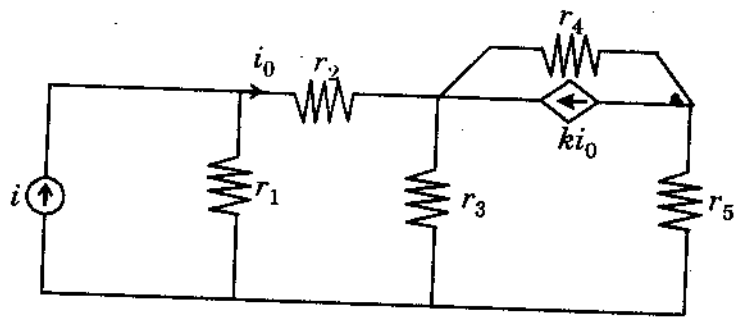

Fig. 3

13. (a) Define average power and power factor. A voltage 500 sin wt is applied to a 50Ω resistor. Calculate the current, instantaneous and average powers.

(5 marks)

(b) Find the form factor and peak factor of the following waveform in Fig. 4.

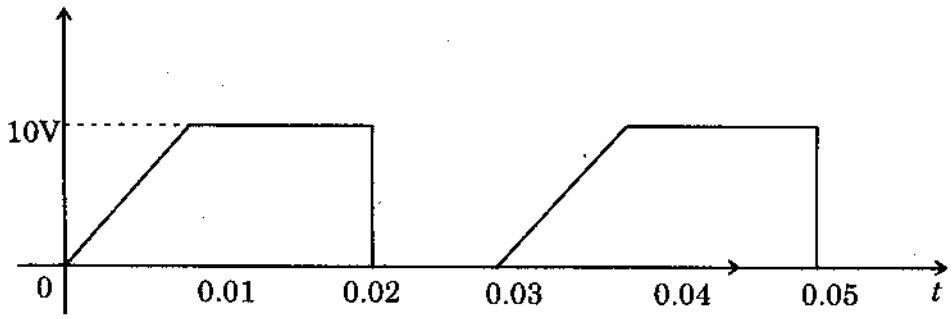

Fig. 4

Or

(7 marks)

14. (a) Derive expressions for average value, r.m.s. value, form factor and peak factor of a sinusoidal voltage of peak value V_m. What is the effect of frequency on these factors ?

(5 marks)

(b) A resistance of 50 Ω in series with 30 microfarad capacitor is connected to a supply of 230 V, 50 Hz. Calculate the (i) Impedance ; (ii) Current ; (iii) Power factor ; (iv) Phase angle ; (v) Voltage across the resistance and the capacitor. Draw the phasor diagram.

(7 marks)

15. (a) Explain the need for the starter for a d.c. motor. (4 marks)

(b) A 25 kVA, 2200 V/220 V, single-phase transformer has a primary resistance of 1Ω and secondary resistance of 0.01 Ω . Calculate the full load efficiency at 0.8 PF if the iron loss in the transformer is 200 W.

(8 marks)

Or

16. (a) What are the advantages of 3-phase transformers compared to single-phase transformers ?

(3 marks)

(b) A 4-pole, 500 V shunt motor takes 7 A on no-load, the no-load speed being 750 r.p.m. It has a shunt field current of 2 A. Calculate the full-load speed of the motor if it takes 122 A at full load. Armature resistance = 0.2 Ω. Contact drop per brush = 1 V. Assume armature reaction weakens the field by 4 % on full-load.

(9 marks)

17. (a) With neat diagrams, explain the constructional features of two types of 3-phase induction motor.

(6 marks)

(b) A 6-pole, 3-phase, 50 Hz induction motor is running at full load with a slip of 4 %. The rotor is star connected and its resistance and stand still reactances are 0.25 Ω and 1.5 Ω per phase. The e.m.f. between slip rings is 100 V. Find the rotor current per phase and PF assuming the slip rings are short circuited.

(6 marks)

Or

18. Three impedances $Z_A = 10 \angle 30° \Omega$, $Z_B = 10 \angle -30° \Omega$ and $Z_C = 10 \angle 60° \Omega$ are connected in Y across a 400 V, 3-phase, 3-wire, ACB sequence symmetrical sources. Find :

(a) Potential of star point of load with respect to supply neutral.

(b) The load phase voltages.

(c) Current in the lines.

(d) Total real, reactive and apparent powers.

(e) Draw the complete vector diagram of voltages and currents.

(f) Also find balanced delta connected resistors that would take same real power as the above load from the same source.

19. (a) Why it is required to have high voltage for long distance transmission ? State the different standards used in Kerala.

(6 marks)

(b) Sketch neatly the one line diagram of a room having one lamp, one fan, one fluorescent lamp and a power plug.

(6 marks)

Or

20. (a) Compare and contrast the overhead and underground system for electric power distribution.

(6 marks)

(b) Explain the principle of CFL ? How does it affect the power quality. (6 marks)

[5 × 12 = 60 marks]