ELE105/205

USN

First/Second Semester B.E. Degree Examination, July/August 2004

Electrical
(Old Scheme)

Electrical Sciences

Time: 3 hrs.] [Max.Marks : 100

Note: *Answer any EIGHT questions from questions 1 to 12 and any SIX questions from questions 13 to 21.*

1. Explain the terms Electric Field & Electric Potential. **(5 Marks)**

2. Explain the difference between self and mutual inductance. **(5 Marks)**

3. State and explain Kirchoff's Laws. **(5 Marks)**

4. The current in the circuit shown in fig 1., from the source is 5 Amps. Determine the value of resistance 'R'.

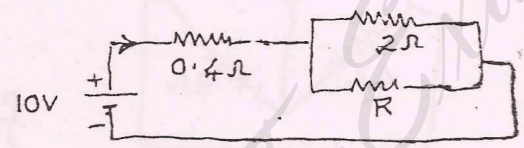

fig ①

(5 Marks)

5. Explain the method of generating an alternating voltage. **(5 Marks)**

6. Explain the advantages of 3 phase systems. **(5 Marks)**

7. State the salient parts of a DC generator and briefly explain the function of each part. **(5 Marks)**

8. A 4 pole 240V, wave connected shunt motor, when running at 1000 RPM draws line and field currents of 51A and 1A respectively. Assuming a drop of 1V/brush and an arm resistance of 0.1Ω, determine the torque developed. **(5 Marks)**

9. Explain the following with reference to a single phase transformer:

   i) core loss

   ii) voltage regulation. **(5 Marks)**

10. A 3 ϕ 4 pole induction motor when operating on 50Hz supply runs at 1440 RPM. If the supply frequency is increased to 60Hz, determine the new speed assuming the slip to be same as before. **(5 Marks)**

11. Why is synchronisation necessary for alternators? State the conditions for successful synchronisation. **(5 Marks)**

Contd.... 2

12. With the help of a circuit diagram, explain two way control of lamps. **(5 Marks)**

13. (a) Derive an expression for the energy stored in a capacitor. **(5 Marks)**

(b) A condensor is composed of two plates separated by a sheet of insulating material 3 mm thick and of relative permitivity 4. The distance between the plates is increased to allow the insertion of a second sheet of 5mm thick of relative permitivity ϵ_r. If the capacitance so formed is $\frac{1}{3}$ of the original capacitance, determine ϵ_r **(5 Marks)**

14. (a) State and explain Faraday's Laws of Electromagnetic induction. **(5 Marks)**

(b) The magnetic circuit of an electromagnetic relay has a mean length of iron circuit = 20cms; length of air gap = 2mm relative permeability of iron = 500. Neglecting leakage, determine the flux density in the air gap if the magnetizing coil has 8000 turns and carries 50mA and the core area is 0.5 sq.cms. **(5 Marks)**

15. (a) Find the effective resistance between a and b in the circuit shown in fig 2., by appropriate network reduction - technique. .

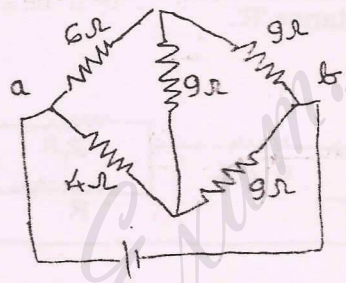

fig ②

(5 Marks)

(b) Using mesh analysis determine the currents in each branch of the electric circuit shown .

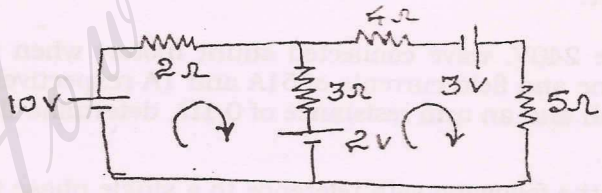

fig ③

(5 Marks)

16. (a) Derive an expression for the RMS and average value of a sinusoidally alternating current in terms of its peak value. **(5 Marks)**

(b) A voltage $v = 100 sin 314t$ is applied to circuit consisting of $80\mu F$ capacitor in series with a 25ohm resistor. Determine the current and power factor in the circuit. **(5 Marks)**

Contd.... 3

17. (a) Derive the equation for the induced EMF in a DC generator. **(5 Marks)**

(b) If 200 volts is directly applied to the armature of a DC shunt motor, the line current is 52 Amps. Find the resistance to be connected in series with the armature to limit the line current to 12A. Take shunt field resistance as 100 ohms. **(5 Marks)**

18. (a) Derive the EMF equation for a single phase transformer. **(5 Marks)**

(b) A 5KVA transformer has an iron loss of 50 watts and a copper loss of 75 watts at rated KVA. Determine its percentage efficiency at

i) rated KVA, 0.8PF lag

ii) rated KVA, 0.6PF lead **(5 Marks)**

19. (a) A 3ϕ induction motor cannot run at synchronous speed; explain the reason. **(5 Marks)**

(b) Briefly explain a star-delta starter, with the help of a circuit diagram showing the switching scheme clearly. **(5 Marks)**

20. (a) Explain the construction of a salient pole - synchronous generator. **(5 Marks)**

(b) A milliammeter whose resistance is 5 ohms gives a full scale deflection for a current of 15mA. Calculate the resistance to be connected in series with it so that it may be used as an voltmeter for measuring voltages upto 100V. **(5 Marks)**

21. (a) Explain the construction and working of a megger. **(5 Marks)**

(b) Explain the working principle of a fluorescent lamp when connected to an electrical supply source, with necessary auxilliary components. **(5 Marks)**

** * **