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Reg. No. : .....

Name : .....

Combined First and Second Semester B.Tech. Degree Examination, December 2016
(2013 Scheme)
13.108 : BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (FR)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **2** marks.

1. Mention the limitations of Ohms law.
2. What is the RMS value of a periodic current ?
3. Define Form Factor and Peak Factor.
4. Comment on "Deflecting Torque" with respect to both MC and MI meters.
5. Define voltage transformation ratio of transformers. Also write the condition for step-up transformer.
6. A 220 V dc motor has an armature resistance of 0.5 ohm. The full load armature current is 20A. Find the induced emf.
7. What is the principle of single phase induction motor ?
8. How do we get unidirectional current flow through PN junction diode ?
9. What are the bias conditions of the base-emitter and base-collector junction for a transistor to operate as an amplifier ?
10. Compare half wave and full wave rectifier.

P.T.O.

PART – B

Answer **any one full** question from **each** Module. **Each** question carries **20** marks.

Module – I

11. a) A coil of resistance 30Ω and inductance 0.6H is switched on to a 240V supply.

a) Calculate the rate of change of current

i) At the instant of closing of the switch when t = 0 and

ii) At time t = 2(L/R);

b) The magnitude of the final steady state current. **5**

b) A 6V battery having an internal resistance of 0.25Ω is connected to a load resistance $R_L = 2\Omega$. Determine the (i) total power supplied to the load (ii) power dissipated and lost within the voltage source (iii) load voltage (iv) terminal voltage and power supplied to the circuit when the voltage source is replaced by an ideal source with the same magnitude of source voltage. **10**

c) Obtain the equation for the voltage across any resistance in a series circuit having "n" number of different resistances **5**

OR

12. a) Define maximum power transfer theorem and derive the condition for maximum power transfer across a load resistance. What is the efficiency under maximum power transfer condition ? Explain in which types of applications such a level of efficiency is acceptable and why ? **10**

b) Derive the mathematical expressions of a series RLC circuit when its response of a dc voltage produces a second-order differential equation with constant coefficients. **10**

Module – II

13. a) What is three phase circuit ? The load in each branch of star connected three phase circuit consists of 10Ω resistance and 0.06H inductance in series. Determine the line voltage and phase current. **8**

b) Four emfs, $e_1 = 100 \sin \omega t$, $e_2 = 80\sin(\omega t - \pi/3)$, $e_3 = 90\sin(\omega t + \pi/4)$, $e_4 = 120\cos \omega t$, are induced in four coils connected in series. Find the resultant emf and its phase difference with (i) e_1 (ii) e_2. **5**

c) Derive the following quantities for a sinusoidal waveform, expressed as V(t) = 110 sin (ωt314). (i) Average value (ii) RMS value. **7**

OR

14. a) Prove mathematically that the driving torque produced in an induction type energy meter is proportional to the speed of the disc. **5**

b) Draw the labelled diagram to show the configuration of a cathode ray tube and describe the functions of each component. **10**

c) Explain three phase four wire system with neat sketch. **5**

Module – III

15. a) A coil of N turns is wound around a rectangular magnetic core. From the first principle, derive the expression for the voltage induced in the coil when it is connected across an ac voltage source of maximum voltage Vm and frequency f Hz. Show that the magnetizing current lags the induced voltage by $\pi/2$ radians. State all the assumptions made. **10**

b) Explain with the help of a sketch, the constructional features of a dc machine and briefly describe the functions of (i) armature core (ii) commutator (iii) brushes. **10**

OR

16. a) Show that the speed of a dc motor is directly proportional to its back emf and inversely proportional to its flux per pole. Therefore derive an expression for the ratio of the speed of a dc series motor when (i) the motor is operating on the linear operation of the magnetic characteristics (ii) the magnetic circuit is saturated. **8**

b) A dc series motor has a speed of 500 rpm when it draws a current of 50 A from a dc supply source of 300 V. Calculate the speed of the motor when it draws a current of 90A. The series field and armature winding resistances are 0.2Ω and 0.15Ω, respectively. Assume a voltage drop of 1V per brush. **7**

c) State the significant specifications for earthing installations, equipment, appliances etc. **5**

Module – IV

17. a) Explain the V-I characteristics of PN junction diode. **6**

    b) Derive the relation between α, β, γ in transistor configuration. **6**

    c) Explain the operation of the full wave bridge rectifier. Give waveforms of input and output voltage. Also derive the output voltage, ripple factor, efficiency and voltage regulation. **8**

OR

18. a) Discuss the effect of simultaneous application of biasing and drain source voltages on depletion layer and the resultant effect on the operation of a JFET. **10**

    b) Describe the principle involved in the photoconductive cell and photovoltaic cell. **10**