

C 20287

(2 Pages)

Name

Reg. No

**EIGHTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
JUNE 2006**

PTEE 2K 702/EE 2K 804—POWER SYSTEMS—III

Time : Three Hours

Maximum : 100 Marks

Answer all questions.

- I. (a) What is meant by power system earthing? How is it different from equipment earthing?
(b) Discuss briefly what is meant by insulation coordination.
(c) Explain with the help of a diagram the different zones of protection in a power system.
(d) What are the main elements of a static relay? Discuss their functions.
(e) Critically evaluate electric heating with other forms of heating.
(f) Compare electric traction with diesel electric traction.
(g) What are the avenues available for energy conservation in domestic lighting?
(h) What are the sources of harmonics in power systems?

(8 × 5 = 40 marks)

- II. (a) Explain the terms (i) Re-striking voltage, (ii) Recovery voltage and (iii) RRRV. Derive the expression of re-striking voltage in terms of systems voltage, inductance and capacitance across a CB contact when a 3-phase fault occurs. Assume that the neutral of the system is solidly grounded.

Or

- (b) A 11 kV, 50 Hz alternator is connected to a system which has an inductance and capacitance per phase of 10 mH and 0.01 μ F. Determine (i) maximum voltage across the breaker contacts, (ii) frequency of transient oscillations, (iii) average RRRV and (iv) maximum RRRV.

- III. (a) What is universal torque equation? Using this equation derive the following characteristics
(i) Impedance relay and (ii) Mho relay.

Or

- (b) A three phase 33kV star connected alternator is to be protected using circulating current protection. The pilot wires are connected to the secondary windings of 100/5A rated current transformer. The protective relay is adjusted to operate with an out of balance current of 1 A in the pilot wire. Determine (i) the earthing resistance which will protect 90% of the winding and (ii) the percentage of the winding which would be protected if the earthing resistance is 15 Ω .

- IV. (a) What are the requirements of an ideal traction system?

A locomotive is hauling a train along a level track at a constant speed of 64.36 km/hour and is exerting a tractive effort of 45 000 Newton. (i) What is the power exerted by the locomotive? If the train meets a gradient necessitating an increase in tractive effort to 67 500 Newton, what will be the power required if the locomotive is driven by a DC series motor ($N \propto 1/1$)?

Or

Turn over

- (b) Dielectric heating is used to heat a slab of insulating material 20 mm thick and 1500 square mm in area. The power required is 200 W and the frequency of the supply is 30 MHz. The material has a permittivity of 5 and a power factor of 0.05. Determine the voltage required to heat the material.

If the voltage is to be restricted to 600 V, what would be the frequency to be used ?

- V. (a) Explain the term Power Quality and its implications on the normal working of power systems. What are the methods available for improving the power quality ?

Or

- (b) A 37 kW motor is required to drive a pump that is to be in operation for 3000 hours per annum. Two makes of motors of similar reliability and maintenance requirements are available

Motor A initial cost Rs. 44,400 and efficiency = 85 %

Motor B initial cost Rs. 56,000 and efficiency = 92 %

The unit cost of electrical energy is Rs. 3.00 and interest and depreciation may be taken as 10 %. Which motor will be your choice ?

(4 × 15 = 60 marks)