C 6270-A (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2005

EE2K 604—POWER SYSTEMS—I

(New Scheme)

Time : Three hours Maximum : 100 marks

I. (a) Write the factors in the choice of site for hydroelectric power station.

(b) A generating station has a connected load of 40 MW and a maximum demand of 20 MW, the units generated being 60×10^6 per annum. Calculate (i) the demand factor ; (ii) the load factor.

(c) Write a short note on line supports for overhead lines.

(d) Derive the expression for insulation resistance of a cable.

(e) Give a brief account of economic loading of distribution transformers.

(f) Explain (i) primary distribution system ; and (ii) secondary distribution system.

(g) Determine the values of generalised line constants for a short transmission line.

(h) Write a short note on bundled capacitors with its advantages.

($8 \times 5 = 40$ marks)

Unit I

II. (a) Explain the functions of the following :—

(i) Dam. (ii) Spill ways.

(iii) Surge tank. (iv) Head works.

(v) Draft tube.

($5 \times 3 = 15$ marks)

Or

(b) Write short notes on the following :—

(i) Two part tariff. (ii) Power factor tariff.

(iii) Three part tariff.

($3 \times 5 = 15$ marks)

Unit II

III. (a) Explain in detail the methods of improving string efficiency. (15 marks)

Or

(b) Explain with relevant expressions the following phenomenon :—

(i) Critical disruptive voltage.

(ii) Visual critical voltage.

(15 marks)

Turn over

Unit III

IV. (a) (i) State Kelvin's law. (3 marks)

(ii) A 2-conductor cable 1 km. long is required to supply a constant current of 200 A throughout the year. The cost of cable including installation is Rs. $(20\ a + 20)$ per metre where 'a' is the area of cross-section of the conductor in cm^2. The cost of energy is 5 Paise per kWh and interest and depreciation charges amount to 10 %. Calculate the most economical conductor size. Assume resistivity of conductor material to be 1.73 μ -Ω cm.

(12 marks)

Or

(b) (i) Derive the expression for capacitance of a single core cable. (8 marks)

(ii) Calculate the capacitance and charging current of a single core cable used on a 3-phase, 66 kV system. The cable is 1 km. long having a core diameter of 10 cm. and an impregnated paper insulation of thickness 7 cm. The relative permittivity of the insulation may be taken as 4 and the supply at 50 Hz.

(7 marks)

Unit IV

V. (a) A (medium) single-phase Transmission line 100 km. long has the following constants :—

Resistance/km. = 0.25 Ω, Reactance/km. = 0.8 Ω, Susceptance/km. = 14×10^{-6} mho, receiving end line voltage = 66,000 V.

Assuming that the total capacitance of the line is localised at the receiving end alone, determine (i) the sending end current ; (ii) the sending end voltage ; (iii) regulation ; and (iv) supply power factor. The line is delivering 15,000 kW at 0.8 p.f. lagging. Draw the vector diagram.

(15 marks)

Or

(b) An overhead 3-phase transmission line delivers 5000 kW at 22 kV at 0.8 p.f. lagging. The resistance and reactance of each conductor is 4Ω and 6Ω respectively. Determine (i) sending end voltage ; (ii) percentage regulation ; and (iii) transmission efficiency.

(3 × 5 = 15 marks)

[4 × 15 = 60 marks]