

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER – V (NEW) EXAMINATION – WINTER 2015

Subject Code: 2150908**Date: 08/12/ 2015****Subject Name: Electrical Power System - I****Time: 10:30am to 1:00pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) With equation find out the volume of conductor in case of 3-phase 3-wire system and 3-phase 4-wire system in overhead power transmission. **07**
- (b) A 2-wire feeder carries a constant current of 250 A throughout the year. The portion of capital cost which is proportional to area of X section is Rs 5 per kg of copper conductor. The interest and depreciation total 10% per annum and the cost of energy is 5P per kWh. Find the most economical area of X-section of the conductor. Given that the density of copper is 8.93 gm/cm^3 and its specific resistance is $1.73 \times 10^{-8} \Omega\text{-m}$. **07**
- Q.2** (a) Define the sag in overhead line. Derive the equation of sag in case of When supports are at equal and unequal level. Also find the sag during effect of wind and ice loading **07**
- (b) What is string efficiency? Derive its equation in case of 3 disc string. Explain methods of improving string efficiency. **07**
- OR**
- (b) Each line of a 3-phase system is suspended by a string of 3 identical insulators of self capacitance C farad. The shunt capacitance of connecting metal work of each insulator is 0.2C to earth and 0.1C to line. Calculate string efficiency of the system if a guard ring increases the capacitance to the line of metal work of the lowest insulator to 0.3C. **07**
- Q.3** (a) Derive the equation for inductance of three phase line with unsymmetrical spacing. Assume transposition. **07**
- (b) Derive the equation for inductance of single phase two wire line. **07**
- OR**
- Q.3** (a) Derive equation for capacitance of single phase two wire line. **07**
- (b) Derive equation of capacitance of three phase line with unsymmetrical spacing Assume transposition. **07**
- Q.4** (a) Explain connection schemes of Distribution System. **07**
- (b) A 2-wire dc street mains AB, 600 m long is fed from both ends at 220 V. Loads of 20A, 40A, 50A and 30A are tapped at distances of 100m, 250m, 400m and 500m from the end A respectively. If the area of X-section of distributor conductor is 1 cm^2 , find the minimum consumer voltage. Take $\rho = 1.7 \times 10^{-6} \Omega \text{ cm}$. **07**
- OR**
- Q.4** (a) A single phase distributor 2 kilometers long supplied of 120 A at 0.8 p.f. lagging at its far end and a load of 80 A at 0.9 p.f. lagging at its mid-point. Both p.f are referred to the voltage at the far end. The resistance and reactance per km (go and return) are 0.05Ω and 0.1Ω respectively. If voltage at the far end is maintained at 230 V, calculate: (i) voltage at the sending end (ii) phase angle between voltages at the two ends. **07**
- (b) Explain power factor and power control in synchronous machine. **07**
- Q.5** (a) Determine generalized constant for medium transmission line by nominal π method. **07**
- (b) With diagram explain construction of Screened cables. **07**
- OR**
- Q.5** (a) Determine generalized constant for medium transmission line by nominal T method. **07**
- (b) Define grading of cable. Explain inter sheath grading with diagram and equation. **07**
