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Total Number of Pages: 02

**B.TECH**  
**PCEE4401**

**7<sup>th</sup> Semester Regular / Back Examination 2015-16**  
**ELECTRICAL POWER TRANSMISSION AND DISTRIBUTION**

**BRANCH: EEE**

**Time: 3 Hours**

**Max marks: 70**

**Question Code: T189**

**Answer Question No.1 which is compulsory and any five from the rest.**  
**The figures in the right hand margin indicate marks.**

- Q1 Answer the following questions: (2 x 10)**
- a) Justify that the effect of ground on the capacitance of a line is negligible.
  - b) The self inductance of a long cylindrical conductor due to its internal flux linkages is 1 mH/km. What will be its self inductance if the diameter of this conductor is increased three times?
  - c) What is the advantage of bundled conductors?
  - d) Why long lines usually need reactive power compensation equipments for proper operation?
  - e) State the advantages of double circuit line over single circuit line.
  - f) What are the various types of HVDC links?
  - g) What is the limitation of kelvin's law?
  - h) What is the function of capacitors in electrical distribution networks?
  - i) Why is it necessary to earth neutral?
  - j) What is actual touch voltage?
- Q2 a) Derive the expression for inductance per kilometer of a three phase line with diagonal spacing between the conductors. (5)**
- b) Show that the inductance per unit length of an overhead line due to internal flux linkages is constant and is independent of size of conductor. (5)**
- Q3 a) Derive the expression for capacitance of a three phase line with unsymmetrical spacing. (5)**
- b) Calculate the capacitance of a conductor per phase of a three phase 400 km long line with the conductors spaced at the corners of an equilateral triangle of side 3.5 m and the diameter of each conductor is 2.8 cm. (5)**

- Q4** a) Draw the equivalent circuit and phasor diagram of T modeled medium transmission line. From this, derive the expressions for sending end voltage and sending end current. (5)
- b) In an insulator string of 3 units, each unit has a capacitance of C. The capacitance between each joint and tower is  $0.2C$ . A grading ring is provided. The capacitance between grading ring and lowest joint is  $0.4C$ . The capacitance between grading ring and second lowest joint is  $0.1 C$ . Find string efficiency (5)
- Q5** a) Discuss in detail the various equipments used in HVDC converter station (5)
- b) It is required to obtain a direct voltage of 100 kV from a bridge connected rectifier operating with  $\alpha=60^\circ$  and  $\gamma=10^\circ$ . Calculate the necessary line secondary voltage of the rectifier transformer which is normally rated at 345 kV/150kV. Calculate the tap ratio required. (5)
- Q6** a) Derive expressions for sag and tension in a power conductor strung between two supports at equal heights taking into account the wind and ice loadings. (5)
- b) An overhead line has a span of 300m. The conductor diameter is 1.953 cm and the conductor weight is 0.844 kg/m. calculate the vertical sag when a wind pressure is 736 N/sq.m of projected area acts on conductor. The breaking strength of conductor is 77990 N and the conductor should not exceed half the breaking strength. (5)
- Q7** a) Find the most economical size of a single-core cable working on a 132 kV, three phase system, if the dielectric stress of 5kV/mm can be allowed. (5)
- b) Show that for a concentric cable of given diameter and given maximum potential gradient in the dielectric, the maximum permissible voltage between the core and the sheath is independent of the permittivity of the insulating material. (5)
- Q8** Write short notes on any two: (5 x 2)
- a) Capacitance of three phase line with equilateral spacing
- b) Improvement of string efficiency of line insulator
- c) Secondary distribution system
- d) HVDC Cable