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Total number of printed pages – 2

B. Tech  
PCEE 4401

**Seventh Semester Examination – 2013**

**ELECTRICAL POWER TRANSMISSION AND DISTRIBUTION**

**BRANCH : EEE**

**QUESTION CODE : C-180**

**Full Marks – 70**

**Time : 3 Hours**

*Answer Question No. 1 which is compulsory and any **five** from the rest.*

*The figures in the right-hand margin indicate marks.*

1. Answer the following questions : 2 × 10
- The effect of ground on the capacitance of a line is negligible. Give reason.
  - What is equivalent spacing of a 3-phase line? What is its significance?
  - What is the effect of using bundled conductors on line inductance?
  - Why long lines usually need reactive power compensation equipments for proper operation?
  - Why do most HVDC systems use 12 pulse converter?
  - How is conductor spacing related to line voltage?
  - Why is sheath used in cables?
  - Single core cables are usually not provided with steel armour. Give reason.
  - Why is it necessary to earth neutral?
  - What factors govern soil resistivity?
2. (a) Derive the expression for the inductance of a single-phase line. 5
- (b) A 3-phase single circuit 132 kV overhead line has conductors of diameter 1.8 cm each. The spacing between conductors is 4 m, 6 m and 9 m. Find the inductance per phase per km. 5
3. (a) Derive the capacitance of a three-phase line with equilateral spacing. 5

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- (b) A 3-phase, 132 kV, 100 km, 50 Hz, single-circuit line has horizontal spacing with 3.5 m between adjacent conductors. The conductor diameter is 1.2 cm. Find the line capacitance per phase and charging current per phase. 5
4. A 275 kV 3-phase line has parameters  $A = 0.95 \angle 3^\circ$  and  $B = 80 \angle 75^\circ$  ohms per phase. For receiving end voltage of 275 kV
- calculate sending end voltage for a receiving end load of 250 MW at 0.85 lagging power factor
  - calculate the additional reactive power which the compensation plant at the receiving end must supply for a load of 400 MVA at 0.9 lagging power factor if the sending end voltage is to be maintained at 300 kV. 10
5. (a) Explain the functionalities of the following equipments in a converter station  
(i) Converter transformer, (ii) Harmonic filtering equipment. 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
6. (a) What are the different types of feeders and distributors? Give their relative advantages and disadvantages. 5
- (b) What is lamp flicker? What are its causes? How can it be reduced? 5
7. (a) A single core cable for 66 kV, 3-phase system has a conductor of 2 cm diameter and sheath of inside diameter 5.3 cm. It is required to have two intersheaths so that stress varies between the same maximum and minimum values in the three layers of dielectric. Find the positions of intersheaths, maximum and minimum stress and voltages on the intersheaths. 5
- (b) Explain the procedure to design an earthing grid. 5
8. Write short notes on any **two** : 5×2
- Inductance of a three-phase line with unsymmetrical spacing
  - Representation of medium transmission lines
  - Application of capacitors to distribution systems
  - HVDC cables.