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B.Tech
PEL4G001

4th Semester Regular Examination 2017-18
TRANSMISSION & DISTRIBUTION SYSTEM

BRANCH: EEE

Time: 3 Hours

Max Marks: 100

Q.CODE: C1156

Answer Part-A which is compulsory and any four from Part-B.

The figures in the right hand margin indicate marks.

Answer all parts of a question at a place.

Part – A (Answer all the questions)

- Q1** Answer the following questions: *multiple type or dash fill up type* (2 x 10)
- a) The dimensions of constants B and C are respectively and.....
 - b) If capacitance between two conductors of a 3-phase line is 4 micro Farad, then capacitance of each conductor to neutral is.....
 - c) The main consideration in the design of a feeder is the.....
 - d) A metallic sheath is provided over the insulation to protect the cable from.....
 - e) High voltage transmission lines are transposed because then
 - i) corona losses can be minimized
 - ii) computation of inductance becomes easier
 - iii) voltage drop in the lines can be minimized
 - iv) phase voltage imbalances can be minimized
 - f) Conductors used in HV transmission lines are stranded because of
 - i) increase tensile strength
 - ii) ease of handling
 - iii) cheaper in cost
 - iv) reduced resistivity
 - g) In an HVDC system
 - i) both generation and distribution are dc
 - ii) generation is ac and distribution is dc
 - iii) generation is dc and distribution is ac
 - iv) both generation and distribution are ac.
 - h) Effect of temperature rise in overhead lines is to
 - i) increase the sag and decrease the tension
 - ii) decrease the sag and increase the tension
 - iii) increase both
 - iv) decrease both
 - i) The inductance of a single phase two wire power transmission line per km gets doubled when the
 - i) distance between the wires is doubled
 - ii) distance between the wires is increased four fold
 - iii) the distance between the wires is increased as square of the original distance
 - iv) radius of the wire is doubled

- j) For the same voltage drop, increasing the voltage of a distributor n-times
- Reduces the x-section of the conductor by n-times
 - Increases the x-section of the conductor by n-times
 - Reduces the x-section of the conductor by n^2 -times
 - Increases the x-section of the conductor by n^2 -times

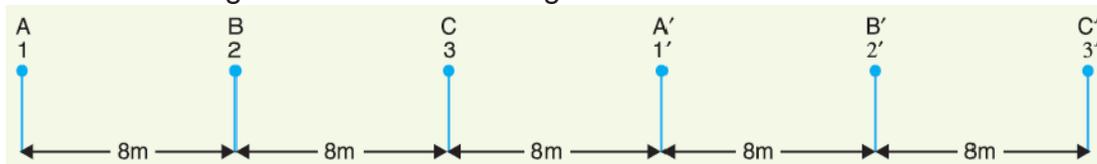
Q2 Answer the following questions: **Short answer type** (2 x 10)

- What are the effects of low power factor, active power demand remaining same?
- What is bundled conductor? Explain with diagram.
- What is the difference between neutral and ground?
- What do you mean by Ferranti effect? How to reduce it?
- Draw the phasor diagram of medium transmission line (end condenser method).
- What is proximity effect and skin effect?
- How 3 wire transmission system is converted to 4 wire distribution system?
- What do you mean by step voltage and touch voltage?
- Define terms: feeder, distributor and service mains.
- Why we need per unit system in case of analysis of transmission system?

Part – B (Answer any four questions)

Q3 a) Draw the equivalent circuit and phasor diagram of transmission line (PI method). Hence derive the ABCD parameters of the above. Also check the condition of symmetry and reciprocity. (10)

b) Calculate the inductance per phase per metre for a three-phase double-circuit line whose phase conductors have a radius of 5.3 cm with the horizontal conductor arrangement as shown in Figure shown below. (5)



Q4 a) What do you mean by sag? Calculate sag (i) when the supports are at equal levels (ii) when the supports are at unequal levels. (10)

b) A transmission line has a span of 275 m between level supports. The conductor has an effective diameter of 1.96 cm and weighs 0.865 kg/m. Its ultimate strength is 8060 kg. If the conductor has ice coating of radial thickness 1.27 cm and is subjected to a wind pressure of 3.9 gm/cm² of projected area, calculate sag for a safety factor of 2. Weight of 1 c.c. of ice is 0.91 gm. (5)

Q5 a) What do you mean by string efficiency? Can it be 100%? Derive the mathematical expression for string efficiency for a string of three insulators. Discuss different methods of improving string efficiency. (10)

b) Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the insulator connected to conductor is 17.5 kV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is 1/8th of the capacitance of the insulator itself. Also find the string efficiency. (5)

Q6 a) What do you mean by reactive power compensation? Discuss different types of reactive power compensators. Compare static and dynamic compensators. (10)

- b)** Two conductors of a d.c. distributor cable AB 1000 m long have a total resistance of 0.1Ω . The ends A and B are fed at 240 V. The cable is uniformly loaded at 0.5 A per metre length and has concentrated loads of 120 A, 60 A, 100 A and 40 A at points distant 200 m, 400 m, 700 m and 900 m respectively from the end A. Calculate (i) the point of minimum potential (ii) currents supplied from ends A and B (iii) the value of minimum potential. **(5)**
- Q7 a)** A single core cable for use on 11 kV, 50 Hz system has conductor area of 0.645 cm^2 and internal diameter of sheath is 2.18 cm. The permittivity of the dielectric used in the cable is 3.5. Find (i) the maximum electrostatic stress in the cable (ii) minimum electrostatic stress in the cable (iii) capacitance of the cable per km length (iv) charging current. **(10)**
- b)** What are the advantages and disadvantages of underground cables? What do you mean by grading of cables? Explain different methods of grading of cables. **(5)**
- Q8 a)** A d.c. ring main ABCDA is fed from point A from a 250 V supply and the resistances (including both lead and return) of various sections are as follows : AB = 0.02Ω ; BC = 0.018Ω ; CD = 0.025Ω and DA = 0.02Ω . The main supplies loads of 150 A at B ; 300 A at C and 250 A at D. Determine the voltage at each load point. If the points A and C are linked through an interconnector of resistance 0.02Ω , determine the new voltage at each load point. **(10)**
- b)** With neat diagram explain Kelvin's law for conductor size. What are its limitations? **(5)**
- Q9 a)** Discuss various connection schemes of distribution system. With neat diagram explain AC distribution system. Discuss its merits and demerits over DC distribution system. **(10)**
- b)** A 3-phase, 50 Hz transmission line 100 km long delivers 20 MW at 0.9 p.f. lagging and at 110 kV. The resistance and reactance of the line per phase per km are 0.2Ω and 0.4Ω respectively, while capacitance admittance is 2.5×10^{-6} siemen/km/phase. Calculate: (i) the current and voltage at the sending end (ii) efficiency of transmission. Use nominal T method. **(5)**