

**B 2202**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Fifth Semester

Electrical and Electronics Engineering

EE 335 — TRANSMISSION AND DISTRIBUTION

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Compare radial and ring main distribution system.
2. List any two advantages of high transmission voltage.
3. What is skin effect?
4. A single phase line has two parallel conductors 2 meters apart. The diameter of each conductor is 1.2 cm. Calculate the loop inductance per km of the line.
5. What is the effect of load power factor on efficiency of a transmission line?
6. Evaluate the generalised circuit constants for short transmission line.
7. Name the important components of an overhead transmission line.
8. A single core cable has a conductor diameter of 1 cm and internal sheath diameter of 1.8 cm. If impregnated paper of relative permittivity 4 is used as the insulation, calculate the capacitance for 1 km length of the cable.
9. Draw the stringing chart.
10. What is meant by three part tariff?

PART B — (5 × 16 = 80 marks)

11. (a) Compare EHVAC and HVDC transmission. (16)

Or

- (b) (i) Draw and explain the structure of a typical ac power system network. (8)
- (ii) What are the recent trends in power transmission? (8)

12. (a) (i) Derive the expression for capacitance of a single phase two wire line. (8)
- (ii) A  $3\phi$ , 50 Hz, 132 kV overhead line has conductors placed in a horizontal plane 4 m apart. Conductor diameter is 2 cm. If the line length is 100 km, calculate the charging current per phase assuming complete transposition. (8)

Or

- (b) Derive an expression for the inductance per phase for a  $3\phi$  overhead transmission line when
- (i) conductors are symmetrically placed. (8)
- (ii) conductors are unsymmetrically placed but the line is completely transposed. (8)

13. (a) Show how regulation and transmission efficiency are determined for medium lines using (i) nominal T method (ii) nominal  $\pi$  method. (8 + 8)

Or

- (b) Using rigorous method, derive expressions for sending end voltage and current for a long transmission line. (16)

14. (a) (i) What is string efficiency? (3)
- (ii) List the methods to improve the string efficiency. (3)
- (iii) In a 33 kV overhead line, there are three units in the string of insulators. If the capacitances between each insulator pin and earth is 11% of self capacitance of each insulator, find the distribution of voltage over 3 insulators and the string efficiency. (10)

Or

- (b) (i) Deduce an expression for the capacitance of a single core cable.
- (ii) A 33 kV, 50 Hz,  $3\phi$  underground cable, 4 km long uses three single core cables. Each of the conductor has a diameter of 2.5 cm and the radial thickness of insulation is 0.5 cm. Determine
- (1) capacitances of the cable/phase
- (2) charging current/phase
- (3) total charging kVAR.

The relative permittivity of insulation is 3. (8 + 8)

15. (a) (i) Deduce an approximate expression for sag in overhead lines when supports are at equal levels.

(ii) A transmission line has a span of 200 m between level supports. The conductor has a cross-sectional area of  $1.29 \text{ cm}^2$ . Weighs  $1170 \text{ kg/km}$  and has a breaking stress of  $4218 \text{ kg/cm}^2$ . Calculate the sag for a safety factor of 5 allowing a wind pressure of  $122 \text{ kg per m}^2$  of projected area. What is the vertical sag? (6 + 10)

Or

(b) (i) Describe the desirable characteristics of a tariff.

(ii) An electric supply company having a maximum load of 50 MW generates  $18 \times 10^7$  units per annum and the supply consumers have an aggregate demand of 75 MW. The annual expenses including capital charges are

for fuel = Rs. 90 lakhs

fixed charges concerning generation = Rs. 28 lakhs

fixed charges concerning T and D = Rs. 32 lakhs.

Assuming 90% of the fuel cost is essential to running charges and the loss in T and D as 15% of kWh generated, deduce a two part tariff to find the actual cost of supply to the consumers. (6 + 10)

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two wire  
(8)

placed in a  
If the line  
per phase  
(8)

overhead

(8)

completely  
(8)

mined for  
d. (8 + 8)

voltage and  
(16)

(3)

(3)

string of  
and earth  
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(10)

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