G 462 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

ELECTRICAL POWER TRANSMISSION (E)

(Old Scheme—Supplementary/Mercy Chance)

[Prior to 2010 Admissions]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. What is transported transmission line ? What is its effect on the performance of the line ?
2. Clearly explain what you understand by GMR and GMD of a transmission line.
3. What are the different types of line supports ? Explain.
4. Define string efficiency. Why is it necessary to have high string efficiency ?
5. Briefly explain the effect of powerfactor on the regulation of short transmission line.
6. Describe the "off-load" and "on-load" tap changing transformers.
7. Describe the phenomenon of corona. Explain the factors affecting corona.
8. Briefly discuss the classification of substations.
9. Discuss the methods to increase the transmission capability of EHV lines.
10. Discuss the advantages of HVDC transmission system.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Derive an expression for inductance of a single-phase two wire system. (7 marks)

    (b) Calculate the inductance of a single-phase circuit comprising of two parallel conductors of 6 mm. in diameter spaced 1 m. apart. If the material of conductor is (i) copper ; and (ii) steel with a relative permeability of 1 and 50 respectively.

Or

12. Derive an expression for capacitance of a three-phase transmission line with unequal spacing assuming uniform transposition.

Turn over

13. (a) What are bundled conductors ? Discuss the advantages of bundled conductors, when used for OH lines.

(6 marks)

(b) A transmission line has a span of 150 m. between level supports. The line conductor has a cross-section area of 1.25 cm^2 and it weighs 120 kg. per 100 m. If the breaking stress of the copper conductor is 4200 kg/cm^2, calculate the maximum sag for a safety factor of 4. Assume a maximum wind pressure of 90 kg/m^2.

(6 marks)

Or

14. (a) What electrical and mechanical characteristics are required for a good insulator for using in HV transmission lines ?

(5 marks)

(b) Each conductor of a 3-phase overhead transmission line is suspended from a cross arm of a steel tower by a string of four suspension insulators. The voltage across the second unit is 15 kV and across the third 27 kV. Find the voltage between conductors and string efficiency.

(7 marks)

15. Explain the rigorous solution of long transmission lines.

Or

16. (a) A three-phase, 50 Hz, 16 km. long overhead transmission line supplies 1000 kW at 11 kV, 0.8 p.f. lagging. The line resistance is 0.03 Ω per phase per km. and the line inductance is 0.7 mH per phase per km. Calculate the sending end voltage, voltage regulation and efficiency of transmission.

(7 marks)

(b) Explain the function of a synchronous phase modifier placed at the receiving end of the transmission line.

(5 marks)

17. (a) Explain the following terms with reference to corona :

(i) Critical disruptive voltage.

(ii) Visual critical voltage.

(6 marks)

(b) A 3-phase, 220 kV, 50 Hz transmission line has equilateral triangular spacing of side 2 m. The conductor diameter is 3 cm. The air density factor and the irregularity factor is 0.95 and 0.83 respectively. Find the disruptive critical voltage and corona loss per km. Assume any data required.

(6 marks)

Or

18. (a) Briefly explain the general layout of a substation. (7 marks)

(b) Write a short note on grounding transformer. (5 marks)

19. (a) Explain the methods to provide reactive power compensation in EHV lines. (7.marks)

(b) Write a note on EHV systems in India. (5 marks)

Or

20. With help of neat diagrams, explain the working of 3-phase converter used in HVDC transmission system. Also derive the expression for output voltage.

[5 × 12 = 60 marks]