

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN

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Course Code

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Fifth Semester B.E. Degree Examinations, February 2025

GENERATION, TRANSMISSION AND DISTRIBUTION

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Missing data, if any, may be suitably assumed

| <u>Q. No</u> | <u>Question</u> | <u>Marks</u> | <u>(RBTL:CO:PI)</u> |
|------------------------|--|--------------|---------------------|
| <u>Module-1</u> | | | |
| 1. | a. Discuss the important factors to be taken into account while selecting site for hydro power plant. | 06 | (2 :1: 1.3.1) |
| | b. Discuss the comparison of the various power plants based on important factors. | 06 | (2 :1: 1.3.1) |
| | c. With neat sketch explain the working of nuclear power plant. | 08 | (2 :1: 1.3.1) |
| (OR) | | | |
| 2. | a. Discuss the merits and demerits of thermal power plant. | 06 | (2 :1: 1.3.1) |
| | b. Write the comparisons between HVDC and HVAC transmission system. | 06 | (2 :1: 1.3.1) |
| | c. Explain the advantages of power transmission at high voltages with necessary equations. | 08 | (3 :1: 2.1.2) |
| <u>Module-2</u> | | | |
| 3. | a. With neat diagram, derive an expression for the sag when the supports are at equal heights. | 06 | (3 : 2: 2.1.2) |
| | b. Explain the advantages of following conductors (i) ACSR (ii) AAC (iii) AAAC (iv) Bundled conductors | 06 | (2 :1: 1.3.1) |
| | c. 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 wind pressure of 3.9 gm/cm ² of projected area. Calculate sag for safety factor of 2. Weight of l.c.c of ice is 0.91gm. | 08 | (3 : 2: 2.1.2) |
| (OR) | | | |
| 4. | a. Derive the mathematical expressions for voltage distribution over a 3-disc string insulators. | 06 | (3 : 2: 2.1.2) |
| | b. Define string efficiency? Explain the methods of improving string efficiency. | 06 | (2 :2: 1.3.1) |
| | c. In a 33 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulators pin and earth is 11 % of self-capacitance of each insulator, find (i) The distribution of voltage over insulators and (ii) string efficiency. | 08 | (3 : 2: 2.1.2) |
| <u>Module-3</u> | | | |
| 5. | a. Calculate the inductance of each conductor in a 3-Ø, 3 wire system when the conductors are arranged in a horizontal plane with spacing such that D ₃₁ =4 m, D ₁₂ =D ₂₃ =2 m. The conductors are transposed and have a diameter of 2.5 cm. | 06 | (3 : 3: 2.1.2) |
| | b. Explain the concept of (i)self GMD (ii)Mutual GMD | 06 | (2 : 3: 1.3.1) |
| | c. Derive an expression for inductance of a conductor due to internal flux. | 08 | (3 : 3: 2.1.2) |
| (OR) | | | |

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI- Performance Indicator)

6. a. A 3-Ø, 50 Hz, 66 kV overhead line conductors are placed in horizontal plane as shown in Fig. Q6 (a). 06 (3 : 3: 2.1.2)

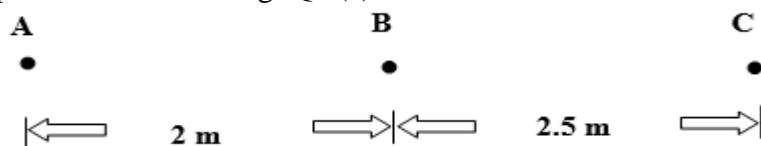


Fig. Q 6(a)

The conductor diameter is 1.25 cm. If the line length is 100 km, calculate

(i) Capacitance/phase (ii) Charging current /phase.

Assuming complete transposition of the line.

- b. Explain the concept of (i) potential at a charged single conductor (ii) potential at a conductor in a group of charged conductors. 06 (2 : 3: 1.3.1)
- c. With a neat diagram, derive an expression for capacitance of a three phase overhead line with unsymmetrical spacing. 08 (3 : 3: 2.1.2)

Module-4

7. a. Determine the voltage regulation and efficiency for medium transmission line using nominal T method. Illustrate your answer with suitable vector diagram. 08 (3 : 4: 2.1.2)
- b. Classify the overhead transmission lines. 04 (2 : 4: 1.3.1)
- c. A three phase, 50 Hz, 150 km line has a resistance, inductive reactance and Capacitive shunt admittance of 0.1Ω , 0.5Ω & $3 \times 10^{-6}/\text{km/phase}$. If the line delivers 50 MW at 110 kV and pf. 0.8 lagging. Determine the sending end voltage and current. Assume a nominal Π circuit of the line. 08 (3 : 4: 2.1.2)

(OR)

8. a. Derive the generalized circuit constants for (i) Short transmission line (ii) medium line - by nominal Π method. 08 (3 : 4: 2.1.2)
- b. Explain advantages & disadvantages of Corona. 04 (2 : 4: 1.3.1)
- c. A 3 phase, 220 kV, 50 Hz transmission line consists of 1.5 cm radius conductor spaced 2 m apart in equilateral triangular formation. If the temperature is 40° & atmospheric pressure is 76 cm, calculate the corona loss per km of the line. Take $m_o = 0.85$. 08 (3 : 4: 2.1.2)

Module-5

9. a. Describe the connection schemes of distribution system. 08 (2 : 4: 1.3.1)
- b. Write a short note on effect of disconnection of neutral in a 3 phase and 4 wire system 04 (2 : 4: 1.3.1)
- c. A single phase AC distributor AB 300 m long is fed from end A and is loaded as under. 08 (3 : 5: 2.1.2)
- (i) 100 A at 0.707 pf lagging 200 m from point A
- (ii) 200 A at 0.8 pf lagging 300 m from point A
- The load resistance & reactance is 0.2Ω and 0.1Ω per kilometre. Calculate the total voltage drop in the distributor. The load pf refers to the voltage at the far end.

(OR)

10. a. With neat sketch explain the construction of underground cables. 08 (2 : 5: 1.3.1)
- b. Write a short note on grading of cables. 04 (2 : 5: 1.3.1)
- c. A single core lead sheathed cable is graded by using three dielectrics of relative permittivity 5, 4 & 3 respectively. The conductor diameter is 2 cm and overall diameter is 8 cm. If the three dielectrics are worked at the same maximum stress of 40 kV/cm, find the safe working voltage of the cable. What will be the value of safe working voltage for an ungraded cable, assuming the same conductor & overall diameter & the maximum dielectric stress? 08 (3 : 5: 2.1.2)

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