*Basavarajeswari Group of Institutions*

# BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

| USN | | | | | | | | | | Course Code | 2 | 1 | E | E | 5 | 2 |
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## Fifth Semester B.E. Degree Examinations, April/May 2024

## 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.***

| Q. No | | Question | Marks | (RBTL:CO:PI) |
|---|---|---|---|---|
| | | **Module-1** | | |
| 1. | **a.** | With neat sketch explain working of Nuclear power plant. | **08** | (2 :1: 1.3.1) |
| | **b.** | List out the merits and demerits of steam power plant. | **06** | (2 :1: 1.3.1) |
| | **c.** | Discuss the important factors to be taken into account while selecting site for hydro power plant. | **06** | (2 :1: 1.3.1) |
| | | **(OR)** | | |
| **2.** | **a.** | Explain the importance of high voltage transmission lines and derive the relevant equations on (i)Volume of conductor (ii) Line losses (iii) Increase in transmission efficiency. | **08** | (3 :1: 1.3.1) |
| | **b.** | With neat sketch explain working of hydroelectric power plant. | **06** | (2:1: 1.3.1) |
| | **c.** | Explain with the help of a neat diagram typical transmission and distribution scheme indicating the standard voltages. | **06** | (2 :1: 1.3.1) |
| | | **Module-2** | | |
| **3.** | **a.** | With neat diagram derive an expression for the sag when the supports are at equal heights. | **08** | (3 :2: 2.1.2) |
| | **b.** | Describe the advantages of (i) ACSR (ii) AAC (iii) AAAC (iv) Bundled conductors. | **04** | (3 :2: 1.3.1) |
| | **c.** | An overhead transmission line has a span of 150 m between level supports. The conductor has a cross sectional area of 2 $cm^2$. The tension in the conductor is 2000 kg. If the specific gravity of the conductor material is 9.9 $gm/cm^3$ and wind pressure is 1.5 kg/m length, Calculate the sag. What is the vertical sag? | **08** | (3 :2: 2.1.2) |
| | | **(OR)** | | |
| **4.** | **a.** | 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) |
| | **b.** | Define string efficiency. Describe the methods of improving string efficiency. | **04** | (2 :2: 1.3.1) |
| | **c.** | Define the term potential distribution over suspension insulator string and hence derive the appropriate mathematical expressions of potential distribution. | **08** | (3 :2: 2.1.2) |
| | | **Module-3** | | |
| **5.** | **a.** | Derive an expression for Inductance of 3-phase lines with equilateral spacing. | **08** | (3 :3: 2.1.2) |
| | **b.** | A single phase transmission line has two parallel conductors 3m apart, the radius of each conductor being 1cm.Calcilate the Loop inductance per kilometre length of the line if material of the conductor is (i) copper (ii) steel with relative permeability of 100 | **06** | (3 :3: 2.1.2) |

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

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|---|---|---|---|---|
| | **c.** | 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 D31=4 m, D12=D23=2 m. The conductors are transposed and have a diameter of 2.5 cm. | **06** | (3 :3: 2.1.2) |
| | | **(OR)** | | |
| **6.** | **a.** | Derive an expression for capacitance of a three phase overhead line with symmetrical spacing. | **08** | (3 :3: 2.1.2) |
| | **b.** | A 3 phase, 50 Hz, 66 kV overhead line has conductors placed in a horizontal plane as d1= 2 m, d2=2.5 and d3=4.5 m apart. Conductor diameter is 2cm.if the line length is 100 km, (i) Calculate Capacitance per phase (ii) Calculate the charging current per phase assuming complete transposition of the line. | **06** | (3 :3: 2.1.2) |
| | **c.** | Derive an expression for potential at a conductor in a group of charged conductors. | **06** | (3 :3: 2.1.2) |
| | | **Module-4** | | |
| **7.** | **a.** | With relevant equivalent and vector diagram, analyze the performance of short transmission line. | **08** | (3 :4: 2.1.2) |
| | **b.** | A three phase, 50 Hz,150 km line has a resistance, inductive reactance and capacitive shunt admittance of 0.1Ω, 0.5Ω and 3 $\times 10^{-6}$ /km/phase. If the line delivers 50 MW at 110 kV and 0.8 pf lagging. Determine the sending end voltage and current. Assume a nominal ∏ circuit of the line. | **08** | (3 :4: 2.1.2) |
| | **c.** | Describe the classification of overhead transmission line. | **04** | (2 :4: 1.3.1) |
| | | **(OR)** | | |
| **8.** | **a.** | Determine the voltage regulation and efficiency for medium transmission line using normal T method. Illustrate your answer with suitable vector diagram. | **08** | (3:4: 2.1.2) |
| | **b.** | A 132 kV line with 1.956 cm diameter conductors is built so that corona takes place if the line voltage exceeds 210 kV (rms). If the value of potential gradient at which ionization occurs can be taken as 30 kV/cm, find the spacing between the conductors. | **08** | (3 :4: 2.1.2) |
| | **c.** | List the advantages and disadvantages of Corona. | **04** | (2 :4: 1.3.1) |
| | | **Module-5** | | |
| **9.** | **a.** | Write a short note on (i) Requirements of distribution system (ii) Skin effect (iii) Transposition of 3-pahse conductors. | **06** | (2 :5: 1.3.1) |
| | **b.** | Explain the connection schemes of Radial, Ring main and interconnected system. | **06** | (2 :5: 1.3.1) |
| | **c.** | Non-reactive loads of 10 kW, 8 kW and 5 kW are connected between the neutral and the red, yellow and blue phases respectively of a 3-phase, 4-wire system. The line voltage is 400 V. Calculate (i) The Current in each line and (ii) the current in the neutral wire. | **08** | (3 :5: 2.1.2) |
| | | **(OR)** | | |
| **10** | **a.** | Explain how the capacitance value varies with the length of a single core cable. | **06** | (2 :5: 1.3.1) |
| | **b.** | With neat sketch Explain construction of 3-conductor cable. | **06** | (2 :5: 2.1.2) |
| | **c.** | A single core lead sheathed cable has a conductor diameter of 3 cm. The diameter of the being 9 cm. The cable is graded with two dielectrics of relative permittivity of 5 and 4 respectively with corresponding safe working stresses of 30 kV/cm and 20 kV/cm. Calculate the radial thickness of each insulation and the safe working voltage of the cable. | **08** | (3 :5: 2.1.2) |

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