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

Fifth Semester B.E. Degree Examinations, September/October 2024

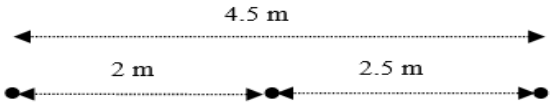
GENERATION, TRANSMISSION AND DISTRIBUTION

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.**	Explain the factors to be considered for the selection of site for a hydroelectric power plant.	**06**	(2 :1: 1.3.1)
	b.	Give the comparison of hydro and steam power plant considering initial cost, maintenance, efficiency, running cost, losses and space required.	**06**	(2 :1: 1.3.1)
	c.	With the neat layout diagram, explain the working of nuclear power plant.	**08**	(2 :1: 1.3.1)
		OR		
2.	**a.**	Explain typical line diagram of Transmission and Distribution scheme indicating voltage levels used at different stages.	**08**	(2:1: 1.3.1)
	b.	Show that increase in transmission voltage causes: (i) Reduction in copper losses (ii) Reduced weight of conductor material.	**06**	(3 :1: 2.1.2)
	c.	Compare HVAC and HVDC transmission system.	**06**	(2:1: 1.3.1)
		Module-2		
3.	**a.**	Briefly explain the following (i) ACSR (ii) AAC (iii) AAAC (iv) Bundled conductors	**06**	(2 :2: 1.3.1)
	b.	Obtain an expression for sag of a line conductor suspended between two equal supports. Assume parabolic configuration.	**06**	(3 :2: 1.3.1)
	c.	The towers of height 30 m and 90 m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500 m. If the tension in the line conductor is 1600 kg, find the minimum clearance of the conductor & water and clearance mid-way between supports. Weight of conductor is 1.5 kg/m. Bases of the towers can be considered to be at water level.	**08**	(3 :2: 2.1.2)
		OR		
4.	**a.**	List the different types of insulators and brief about desirable properties of insulators.	**06**	(2 :2: 1.3.1)
	b.	Explain the different methods to equalize the potential across the string of suspension insulator.	**06**	(2 :2: 1.3.1)
	c.	A 3 phase overhead transmission line is being supported by 3 discs of suspension insulators. The potentials of first & second insulators are 8 kV and 11 kV respectively. Calculate (i) The line voltage (ii) The ratio of capacitance between pin & earth to self-capacitance of each unit (iii) The string efficiency.	**08**	(3 :2: 2.1.2)
		Module-3		
5.	**a.**	Derive an expression for Inductance of a single phase two-wire line.	**08**	(3 :3: 1.3.1)
	b.	Explain the concept of (i) Self GMD (ii) Mutual GMD	**06**	(2:3: 1.3.1)

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

	c.	The three conductors of a 3-phase line are arranged at the corners of a triangle of sides 2 m, 2.5 m and 4.5 m. Calculate the inductance per km of the line when conductors are regularly transposed. The diameter of each conductor is 1.24 cm.	**06**	(3 :3: 2.1.2)
		OR		
6.	**a.**	Derive an expression for line to neutral capacitance of a 3-phase overhead transmission line when the conductors are symmetrically placed.	**08**	(3 :3: 2.1.2)
	b.	A 3-phase, 50 Hz, 66 kV overhead line conductors are placed in a horizontal plane as shown in Fig. 6 (b). The conductor diameter is 1.25 cm. If the line length is 100 km, calculate (i) Capacitance per phase (ii) charging current per phase, assuming complete transposition of the line.	**06**	(3 :3: 2.1.2)
		 **Fig. 6 (b)**		
	c.	What is skin effect? Briefly explain.	**06**	(3 :3: 1.3.1)
		Module-4		
7.	**a.**	Write a short note on classification of transmission lines. Also, explain voltage regulation and transmission efficiency with suitable formula.	**06**	(2 :4: 1.3.1)
	b.	Derive an expression for sending end voltage and sending end current of a single phase medium transmission line employing nominal T method with the help of vector diagram.	**08**	(3 :4: 2.1.2)
	c.	A three-phase, 50 Hz, 150 km line has a resistance, inductive reactance and capacitive shunt admittance of 0.1 Ω, 0.5 Ω and 3×10^{-6} per km per 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.	**06**	(3 :4: 2.1.2)
		OR		
8.	**a.**	What are generalized circuit constants of a transmission line? Determine the ABCD constants of a medium transmission line using nominal π-model and prove AD-BC = 1	**08**	(3:4: 2.1.2)
	b.	What is Corona? State and explain with the expression for disruptive critical voltage and visual critical voltage.	**06**	(2 :4: 1.3.1)
	c.	Write a note on factors affecting the corona and methods to reduce it.	**06**	(2 :4: 1.3.1)
		Module-5		
9.	**a.**	With a neat diagram explain feeders, distributors and service mains.	**06**	(2 :5: 2.1.2)
	b.	With diagram, explain following connection schemes of distribution systems (i) Radial system (ii) Ring main system (iii) Interconnected system.	**06**	(2 :5: 1.3.1)
	c.	Non-reactive loads of 10 kW, 8 kW & 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.**	With a neat diagram, explain general construction of a 3-conductor cable.	**06**	(2 :5: 1.3.1)
	b.	Derive an expression for insulation resistance of a single-core cable.	**06**	(3 :5: 2.1.2)
	c.	A 33 kV, 50 Hz, 3-phase underground cable, 4 km long uses three single core cables. Each of the conductor has a diameter of 2.5 cm and radial thickness of insulation is 0.5 cm. Determine (i) capacitance of the cable per phase (ii) charging current per phase (iii) total charging kVAR. The relative permittivity of insulation is 3.	**08**	(3 :5: 2.1.2)

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