CBCS SCHEME

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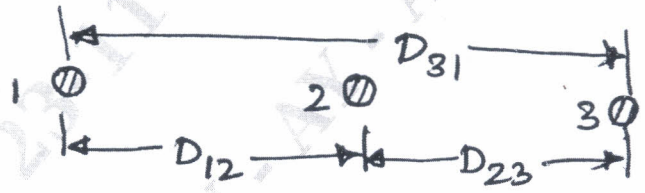
BEE402

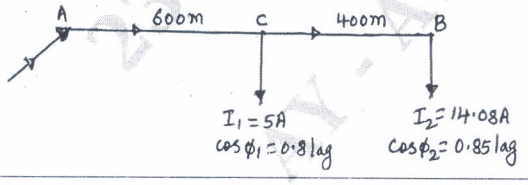
Fourth Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

Transmission and Distribution

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Draw the line diagram of typical power scheme indicating the standard voltages and give a brief description.	06	L2	CO1
	b.	A 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?	07	L3	CO1
	c.	Define string efficiency. What are the methods of increasing string efficiency? Explain.	07	L2	CO1
		OR			
Q.2	a.	Explain bundle conductor and its advantages.	05	L2	CO2
	b.	Discuss the desirable properties of insulators. Explain any two types of insulators with sketch.	08	L2	CO2
	c.	An insulator string consists of three units, each having a safe working voltage of 15 KV. The ratio of self-capacitance to shunt capacitance of each unit is 8:1. Find the maximum safe working voltage of the string. Also find the string efficiency.	07	L3	CO2
		Module – 2			
Q.3	a.	Derive an expression for the inductance of a three phase overhead line due to internal and external flux.	10	L3	CO3
	b.	Explain the concept of self GDM and mutual GDM.	04	L2	CO3
	c.	Calculate the inductance of each conductor in a 3-phase, 3-wire system when the conductors are arranged in a horizontal plane with spacing such that D_{31} = 4m; $D_{12} = D_{23}$ = 2m. The conductors are transposed and have a diameter of 2.5 cm. As shown in Fig.Q3(c).  Fig.Q3(c)	06	L3	CO3
		OR			
Q.4	a.	Derive an expression for the line to neutral capacitance for a 3-phase overhead transmission line when the conductors are unsymmetrically spaced.	10	L3	CO3
	b.	Explain any four advantages of double circuit over single circuit.	05	L2	CO3
	c.	Calculate the capacitance of a 100 km long 3-phase, 50 Hz overhead transmission line consisting of 3 conductors each of diameter 2 cm and spaced 2.5 m at the corners of an equilateral triangle.	05	L3	CO3

		Module – 3			
Q.5	**a.**	Classify in detail the overhead transmission lines.	**06**	**L2**	**CO4**
	b.	A 3-phase, 50 Hz transmission line 100 km long delivers 20 MW at 0.9 p.f. lagging and at 110 KV. The resistance and reactance of the line per phase per km are 0.2 Ω and 0.4 Ω respectively. While capacitance admittance is 2.5×10^{-6} siemen/km/phase. Calculate: (i) The current and voltage at the sending end ; (ii) Efficiency of transmission. Use nominal T-method.	**08**	**L3**	**CO4**
	c.	Derive an expression for ABCD constants of a medium transmission line using nominal π method. Also prove that the line is symmetrical and reciprocal.	**06**	**L2**	**CO4**
		OR			
Q.6	**a.**	What is a Ferranti effect on transmission lines?	**04**	**L2**	**CO4**
	b.	Derive an expression for ABCD constants of a long transmission line. Also prove that the line is symmetrical and reciprocal.	**06**	**L2**	**CO4**
	c.	Find the following for a single circuit transmission line delivering a load of 50 MVA at 110 KV and p.f. 0.8 lagging: (i) Sending end voltage (ii) Sending end current (iii) Sending end power (iv) Efficiency of transmission Given A = D = 0.98∠3°; B = 110∠75° ohm; C = 0.0005∠80° siemen	**10**	**L3**	**CO4**
		Module – 4			
Q.7	**a.**	Explain the phenomenon of corona in overhead transmission line. Also discuss the factors affecting the corona.	**10**	**L2**	**CO4**
	b.	Derive an expression for critical disruptive voltage and visual critical voltage reference to corona.	**05**	**L2**	**CO4**
	c.	A 3-ϕ line has conductors of 2 cm in diameter spaced equilaterally 1m apart. If the dielectric strength of air is 30 kV (max) per cm, find the disruptive critical voltage for the line. Take air density factor δ = 0.952 and irregularity factor m_0 = 0.9.	**05**	**L3**	**CO4**
		OR			
Q.8	**a.**	With the sketch discuss any two types of cables, also the different types of cables based on the voltage level.	**14**	**L2**	**CO4**
	b.	Derive an expression for insulator resistance of a single core cable.	**06**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Discuss with the sketch, the different types of feeders distribution system.	**12**	**L2**	**CO5**
	b.	A 3-phase, 400 V distribution AB is loaded as shown in Fig.Q9(b). The 3-phase load at point 'C' takes 5A per phase at a p.f. of 0.8 lagging. At point B, 3-phase, 400 V induction motor is connected which has an output of 10 H.P with an efficiency of 90% and p.f 0.85 lagging. If voltage at point B is to be maintained at 400 V, what should be the voltage at point A? The resistance and reactance of the line are 1Ω and 0.5Ω per phase per kilometer respectively.  Fig.Q9(b)	**08**	**L2**	**CO5**
		OR			
Q.10	**a.**	Discuss the limitations of distribution system.	**05**	**L2**	**CO6**
	b.	Discuss the power quality and various reliability aids.	**08**	**L2**	**CO6**
	c.	In a 3-phase, 4-wire, 400/230 V system, a lamp of 100 Watts is connected to one phase and neutral and a lamp of 150 Watt is connected to the second phase and neutral. If the neutral wire is disconnected accidentally, what will be the voltage across each lamp?	**07**	**L2**	**CO6**

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