BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : V**
BRANCH: EEE **SESSION : MO/2024**

SUBJECT: EE307 ELECTRICAL POWER TRANSMISSION AND DISTRIBUTION

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Determine A, B, C,D parameters of the pi model for the medium transmission line. Write the equations of voltage regulation and 'No load voltage' relating to line parameters for medium line.	[4+1]	CO1	BL2
Q.1(b)	A 3-phase line is 500 km long. The line constants are z=0.105+j0.3768 ohm/km. Y= $j2.822\times10^{-6}$ siemans/km. The line delivers 40MVA at 0.9 pf lagging at 220 kV. Find the sending end voltage, current, power factor, MVA & power angle.	[5]	CO1	BL3
Q.2(a)	Derive the formula for calculating the capacitance of a three-phase transmission line.	[5]	CO2	BL2
Q.2(b)	Determine the inductance per km of a transposed double circuit 3-ø line shown in Figure 1. Each circuit of the line remains on its own side. The dia of the conductor is 2.532 cm. The vertical distances between a-b, b-c and b'-a' are the same as c'-b' in Figure 1.	[5]	CO2	BL3

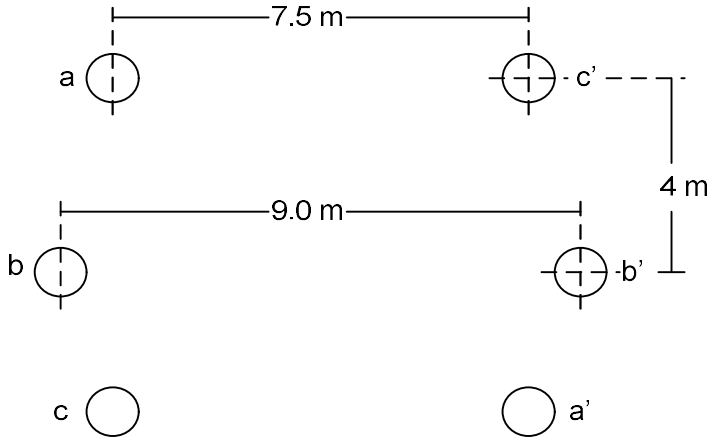

Fig. 1

Q.3(a)	Derive the expression for the most economical size of the conductor. Mention the technical reasons to limit the use of long underground cables.	[3+2]	CO3	BL3
Q.3(b)	Each line of a 3 phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5 kV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is 1/8th of the capacitance of the insulator itself. Also, find the string efficiency.	[5]	CO3	BL3
Q.4(a)	Describe the Ferranti Effect and surge impedance loading in long transmission lines with proper equations and explain their causes.	[3+2]	CO2	BL3
Q.4(b)	Define different types of power factor tariffs. What are the advantages in power system operation for including power factor as tariff ?	[5]	CO3	BL3

PTO

Q.5(a)	Using the same example, show that voltages at load buses of a radial system are improved if the same system with the same loads is converted into a ring system with the same source. Write a short note on the reactive power compensator.	[3+2]	CO5	BL4
Q.5(b)	A 2-wire DC distributor cable AB is 2 km long and supplies loads of 100A, 150A, 200A and 50A situated 500 m, 1000 m, 1600 m and 2000 m from the feeding point A. Each conductor has a resistance of 0·01 Ω per 1000 m. Calculate the potential drop at each load point if a potential drop of 300 V is maintained at point A.	[5]	CO4	BL3

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