

International Islamic University Chittagong
Department of Electrical and Electronic Engineering

B. Sc. Engineering in EEE

Midterm Examination, Spring-2023

Course Code: **EEE-2415**

Course Title: **Transmission and Distribution of
Electrical Power System**

Time: **1 hours 30 minutes**

Full Marks: **30**

- (i) Answer all the questions. The figures in the right-hand margin indicate full marks.
(ii) Course Outcomes (COs) and Bloom's Levels are mentioned in additional Columns.

Course Outcomes (COs) of the Questions	
CO1	Develop the idea to deliver quality power to the end users using Transmission and Distribution System.
CO2	Ability to apply various voltage control techniques to maintain proper voltage at the level of end users.
CO3	Modelling of the transmission and Distribution line to analysis the effect of line parameters on the power flow.

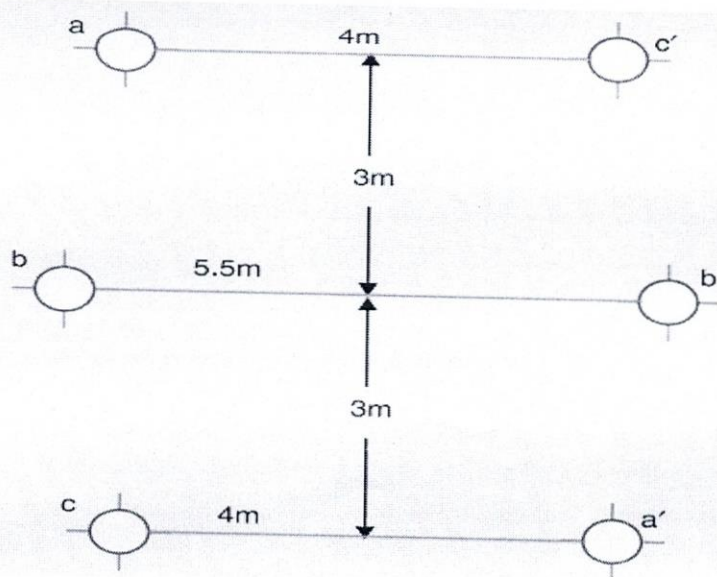
Bloom's Levels of the Questions						
Letter Symbols	R	U	Ap	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

- 1) a) i) What is Skin effect? Why we prefer aluminum conductor over copper conductor in the transmission line?

- ii) Deduce the Mutual-GMD in terms of two conductors, single circuit 3-phase line, and 3-phase double circuit line.

CO1 R, 2+3
 An

- 1) b) Consider a transmission project of BSRM in Mirsharai having 3-phase double circuit line as shown in **Fig. 1**. The conductors are transposed, and are of radius 0.75 cm each. The phase sequence is ABC. Find the inductance per phase per km of this transmission network.



CO3 E 5

Fig. 1

- 2) a) i) Draw the different types of bundled conductor with proper sketch. Also, briefly outline the characteristics of bundled conductor.
- ii) Derive the equation of capacitance of a three phase line with unsymmetrical spacing. Also, briefly mention the effect of earth on the capacitance of a three-phase transmission line. CO3 An 2+4
- 2) b) Suppose your area is electrified from Raozan steam power station using a 3- ϕ , 50 Hz, 132kV overhead transmission line of 125 km length and the conductors of this line are placed in a horizontal plane ($d + 3$) meter apart. The conductor diameter is ($r + 3$) cm. Now, **calculate** the charging current per phase assuming complete transposition. Consider that the values of d and r are equal to last digit of your **Matric ID**. CO3 C 4
- 3) a) i) You may know that Bangladesh government planned to import 500MW electricity from Nepal, For this purpose between AC and DC transmission system, which one is more preferable to you? Give logical arguments in favor of your opinion. CO1, CO3 C, An 2+4
- ii) Draw the vector diagram of short transmission line considering uniform lagging, leading, and unity power factor. Why capacitance is considered in an overhead long transmission line?
- 3) b) An overhead 3-phase transmission line delivers 5100 kW at 20 kV at 0.8 p.f. lagging. The resistance and reactance of the each conductor is 5Ω and 7Ω respectively. Determine i) Sending end voltage, ii) Percentage regulation, and iii) Transmission efficiency. CO3 E 4

OR

- 3) a) i) What is Ferranti effect? Find the transmission line parameter A,B,C,D in case of nominal **T model**, and prove that $AD - BC = 1$.
- ii) List the advantages of high transmission voltage. Also, draw the equivalent circuit of a 3- ϕ long transmission line showing its line parameters. CO1, CO3 R, E, An 4.5+ 2.5
- 3) b) What is the maximum length in kilometer for 1-phase transmission line having copper conductor of 0.775cm^2 cross section area over which 200 kW at unity power factor and at 3.3 kV are to be delivered? The efficiency of transmission is 90%. Take specific resistance as $1.725\text{ micro ohm cm}$. CO3 E 3