Code No: 137CD **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, January/February - 2023

EHV AC TRANSMISSION SYSTEMS

(Electrical and Electronics Engineering)

Time: 3 Hours **Max.Marks:75**

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Why we need EHV AC transmission?	[2]
b)	What are the problems of EHV AC transmission?	[3]
c)	What are the observation are made from sequence inductances and sequence capacitances?	[2]
d)	What is meant by surface voltage gradient on conductors?	[3]
e)	What is meant by Radio interference with corona effect?	[2]
f)	What are the factor for the function of audible noise?	[3]
g)	What is meant by primary shock currents?	[2]
h)	Why you have to study theory of travelling waves?	[3]
i)	What is the need of power circle diagram for line compensation?	[2]
j)	Discuss the protection scheme for series capacitor.	[3]

PART – B

(50 Marks)

2.a) Illustrate the power handling capacity and line loss of transmissions with standard voltages and assumed suitable resistance.

b) Explain the effect of conductor resistance of EHV lines. [5+5]

OR

3.a) What are the mechanical considerations in line performance? Discuss wake-induced oscillation.

b) A power of 2000 MW is to be transmitted from a super thermal power station over 800 km to a city. Use 400 kV and 750 kV alternatives. Suggest the number of circuits required with 50% series capacitor compensation, and calculate the total power loss and loss per km. Assume suitable data. [5+5]

4.a) Derive the complete line parameters with ground return for a transposed line.

b) The dimensions of a 3-phase, 750 kV horizontal line shown in figure are H = 15 m, S = 11 m phase separation, conductor 2 × 3.8 cm dia and B = 48 cm. Find (i) the matrix of capacitance per km, for untransposed configuration and (ii) the same when there is complete transposition. As shown in figure 1. [5+5]

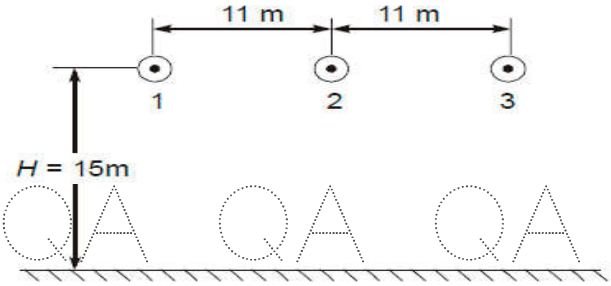

Figure 1

OR

5.a) Derive the general expression for maximum charge condition on a 3-phase line

b) The dimensions of a ± 400 kV dc line are shown in Figure 2. Calculate

i) The charge coefficient $Q/2\pi\varepsilon_0$ for each bundle,

ii) The maximum and minimum surface gradient on the conductors

iii) The average maximum surface voltage gradient of the bundle. [3+4+3]

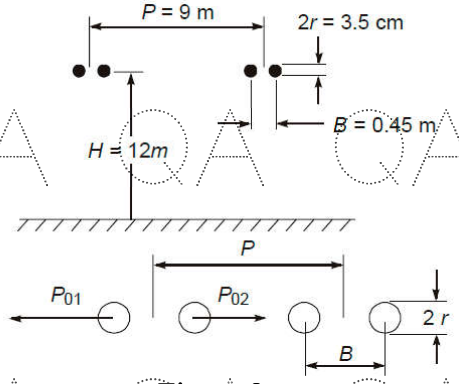

Figure 2

6.a) Derive the energy loss equation from uniform waveform of voltage from charge voltage diagram of corona.

b) A single smooth conductor 1 cm in radius is strung 5 meters above ground using Peek's formula for corona-inception gradient, find

i) The corona-inception voltage,

ii) The equivalent radius of conductor to the outside of the corona envelope at 20% overvoltage. Take δ=1. [5+5]

OR

7. Explain the measurement of RI, RIV and excitation functions with necessary diagrams. [10]

8. Derive the expression for electrostatic field of double circuit 3-phase AC line. [10]

OR

9.a) Starting from first principles show that surges behave as travelling waves.

b) Two stations are connected together by an underground cable having a surge impedance of 60 ohms joined to an overhead line with a surge impedance of 400 ohms. If a surge having a maximum value of 100 kV travels along the cable towards the junction with the overhead line, determine the value of the reflection and refraction wave of voltage and current at the junction. [5+5]

10. Describe the power circle diagram and its use with necessary equations and diagram. [10]

OR

11.a) Explain the static VAR compensating system.

b) Describe the cascade connection of shunt and series compensation. [5+5]

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