Ref. No. : **Ex/EE/5/T/312/2024(S)**

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) SUPPLEMENTARY EXAMINATION – 2024

(3rdYear, 1st Semester)

POWER SYSTEM PLANNING AND DESIGN

Time: Three hours Full Marks: 100

(50 marks for each part)
Use a separate Answer-Script for each part

Part-I

Answer any **THREE**questions.
Question No. 1 carries 18 marks

1. a) Derive the inductance per unit length of an overhead transmission line due to both internal and external flux on the line. **10+4+4**

b) Explain why the receiving end voltage of an unloaded long line may be more than the sending end voltage.

c) A long transmission line is open circuited at the receiving end. Will there be any current in the line at the sending end? Explain your answer.

2. a) Derive **π** and **T**equivalent representation of a medium transmission line. **8+8**

b) Find the GMR of each of the bundled conductors shown in Fig. 1.considering r is the radius of each strand.

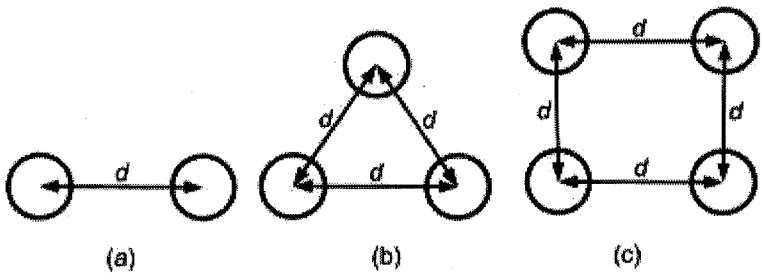

Fig. 1 Cross-sectional view of bundled conductors

3. a) Derive the expression for capacitance of an overhead symmetrically spaced three phase line. **8+8**

b) Derive the expression of inductance of a three phase unsymmetrical spaced but transposed transmission line.

[Turn over

Ref. No. : **Ex/EE/5/T/312/2024(S)**

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) SUPPLEMENTARY EXAMINATION – 2024

(3^{rd}Year, 1^{st} Semester)

POWER SYSTEM PLANNING AND DESIGN

Time: Three hours Full Marks: 100

(50 marks for each part)
Use a separate Answer-Script for each part

4. a) A 50-Hz three-phase transmission line is 200km long. It has a total series impedance of $35 + j140\ \Omega$ and a shunt admittance of 930×10^{-6} S. It delivers 40 MW at 220 kV, with 0.90 power-factor lagging. Find the voltage at the sending end using (a) the short-line approximation, (b) the nominal-T approximation, and (c) the long-line equation. **12+4**

b) What do you understand by propagation constant in a transmission line.

5. **Write short notes on any two of the following:** **8×2**

(i) Traveling wave interpretation of long transmission line
(ii) Skin effect
(iii) Surge impedance loading

Ref No: **Ex/EE/5/T/312/2024(S)**

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) THIRD YEAR
FIRST SEMESTER SUPPLEMENTARY EXAM 2024
SUBJECT: - POWER SYSTEM PLANNING AND DESIGN

Full Marks: 100
Time: Three hours (**50** marks for this part)

Use a separate Answer-Script for each part

No. of Questions		PART -II Answer any Three (Two marks reserved for well organized answers)	Marks
6)	a)	A transmission line conductor at a river crossing is supported from two towers at a height of 50 and 80 meters above water level. The horizontal distance between the towers is 300 meters. If the tension in the conductor is 2000 kg, find the clearance between the conductor and water at a point midway between the towers. Weight of conductor per meter = 0.844 kg.	(8)
	b)	With respect to overhead transmission lines explain the following: (i) Stockbridge dampers. (ii) The factors for configuration of transmission lines towers.	(4+4=8)
7)	a)	Deduce the expression of Sag occurring in a transmission line.	(8)
	b)	Describe the various types of Line supports for overhead transmission lines?	(8)
8)	a)	Explain the type of failures occurring in an insulator and explain how they are taken care of.	(8)
	b)	Determine the overall diameter of a single core cable and its most economical diameter when working on a three phase 275 kV system. The maximum permissible stress in the dielectric is not to exceed 15kV/mm.	(6)
	c)	Expand the following terms: (i)XLPE, (ii) SERC according to electricity act, (iii)PPL insulation, (iv) CGIC cables.	(2)
9)	a)	Mention the features of the following conductors: (i) All Aluminum Conductors (ii) ACSR conductors.	(6)
	b)	Discuss Varley loop method to locate earth fault for an underground cable with necessary diagram.	(6)

(please turn over)

Ref No: **Ex/EE/5/T/312/2024(S)**

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) THIRD YEAR
FIRST SEMESTER SUPPLEMENTARY EXAM 2024
SUBJECT: - POWER SYSTEM PLANNING AND DESIGN

Full Marks: 100
Time: Three hours (**50** marks for this part)

c)	Explain the purpose of an armouring and outer sheath for an underground cable.	(4)
10)	Write short notes on **any two** of the following: a) Market-guided tariffs. b) Power losses occurring in the dielectric of a cable. c) Heads of expenditure in Power management. d) Short-term load management. e) Use of suspension insulators. f) H-type cables.	(2×8)