BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) 3RD YEAR 1ST SEMESTER (OLD) - 2019

POWER SYSTEM PLANNING AND DESIGN

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

Use a separate Answer-Script for each part

PART -I

Answer any three questions

Two marks allotted for neat and to the point answers

1) a) What are the factors to be considered to determine the configuration of transmission line towers? (4 x 4)

b) What are Stockbridge dampers?
How to identify short circuit fault in a cable?

c) Expand the following terms :

d) (i) ACSR (ii)PPL insulation (iii) XLPE insulation (iv) ABT (with respect to tariff)

2) a) Calculate the minimum clearance of the lowest conductor above ground for a 66 kV and 220 kV transmission line. (2)

b) What are the main function and characteristics of line supports? (8)

c) A transmission line having the copper conductor of 7/0.295 cm size, area 0.484 sq. cm, overall diameter 0.889cm, weight 428kg/km and breaking strength 1973kg. Assume factor of safety 2, span 200m and supports at the same height. Calculate maximum sag of the conductor. (6)

3) a) Show that in a single core cable, $\frac{g_{max}}{g_{min}} = \frac{R}{r}$ where g_{max} and g_{min} are the maximum and minimum potential gradients and r and R are the core radius and overall sheath radius respectively. Find out the condition for most economical size of cable. (10+2)

b) What are the advantages of toughened glass over porcelain insulators? (4)

4) a) Describe different types of vibration in transmission line conductors. How can they be prevented? (8)

b) What are the advantages of suspension insulators? (4)

c) Discuss the features of AAAC conductors. (4)

5) a) What are the criteria for suggesting a tariff? (8)

b) Explain Market guided tariff. (8)

[Turn over

Ref No:

Ex/EE/5/T/312/2019 (Old)

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) THIRD YEAR

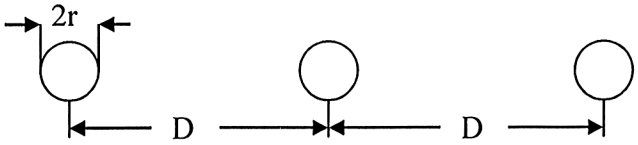
FIRSTSEMESTER (Old) – 2019

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)	 Fig.Q.6.(a) A three phase 50 HZ transmission line consists of three equal conductors of radii r, placed in a horizontal plane, with a spacing of 6 m between the middle and each outer conductor as shown in Fig.Q.6.(a) below. Find the capacitance per kilometer to neutral and the capacitive reactance per phase per kilometer if the radii of each conductor are 12.5 mm.	(8)
	b)	Derive the expression for capacitance per phase of a three phase unsymmetrical spaced but transposed overhead transmission line.	(8)
7)	a)	Calculate the inductive reactance per phase of the transposed line as shown in Fig.Q.6.(a) above. All the data remaining same as in Q.6 (a). Derive the GMD and GMR equations.	(8)
	b)	Determine the inductance of a symmetrically spaced three phase overhead transmission line.	(8)
8)	a)	Derive the **pi** and **T** equivalent representation of medium transmission line.	(8)
	b)	A 3-phase , 50 Hz, transmission line , 40 km long delivers 36 MW at 0.8 power factor lagging at 60 KV (phase). The line constants per conductor are, R=2.5Ω, L=0.1 H, C=0.25μF. Shunt leakage may be neglected. Use the nominal **pi** method to determine voltage, current, power factor, active power and reactive volt-amperes at the sending end.	(8)

(please turn over)

Ref No:

Ex/EE/5/T/312/2019 (Old)

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) THIRD YEAR

FIRSTSEMESTER (Old) – 2019

SUBJECT: - POWER SYSTEM PLANNING AND DESIGN

Full Marks: 100

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

9)	a)	Derive the expressions for the ABCD constant for a lossless long transmission line. Assume distributed parameters.	(8)
	b)	Show that voltage and current at any point of a long transmission line can be resolved into two waves travelling in opposite direction.	(8)
10)		Discuss the following:- (**any two**) 1. Transmission lines are transposed. 2. Skin effect. 3. Effect of earth on line capacitance.	(2×8)