R13

Code No: 118BH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, May - 2017
EHV AC TRANSMISSION
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) What are the merits of EHV AC transmission? [2]
b) What are the properties of bundle conductors? [3]
c) The field strength on the surface of a sphere of 1cm radius is equal to the corona inception gradient in air of 30 kV/cm. Find the charge on the sphere. [2]
d) State the properties field of line changes. [3]
e) What are the factors are to be considered while generating audible noise? [2]
f) List the restrictions on the use of Cigre formula. [3]
g) How the electro static fields effects on animals beings? [2]
h) Define the reflection and refraction coefficients? [3]
i) What are the uses of power circle diagram? [2]
j) What is the need of voltage control of a given power system? [3]

PART - B

(50 Marks)

2.a) What are the voltage levels are recognized in India
b) A power of 1500 MW is required to be transmitted over a distance of 1000 km. At voltage levels of 400 KV, 750 KV, 1000 KV and 1200 KV, determine
i) Possible number of circuits required with equal magnitudes for sending and receiving end voltages with 30^0 phase difference.
ii) The current transmitted and
iii) Total line losses. [5+5]

OR

3.a) Explain the effect of resistance of conductor in EHV AC transmission system.
b) A Drake conductor of North- American manufacture has an outer diameter of 1.108 inches having an Al cross section area of 795,000 circular mils. The stranding is 26 Al/7 Fe. Its resistance is given as 0.0215 ohm/1000' at 20^0C under dc and 0.1284 ohm/mile at 50^0c and 50/60 Hz . Calculate
i) diameter of each stand of Al and Fe in miles, inch and meter units
ii) check the values of resistance given above taking $\rho_a=2.7\times10^{-8}$ ohm-meter at 20^0c and temperature resistance coefficient $\alpha=4.46\times10^{-3}/^0$c at 20^0c
iii) Find increase in resistance due to skin effect. [5+5]

4.a) Explain the surface voltage gradient on conductors in EHVAC system

b) A sphere gap with sphere having radius R=0.5 m has a gap of 0.5 m between their surfaces
i) Calculate the required charges and their locations to make the potentials 100 and 0.
ii) Then calculate the voltage gradient on the surface of the high voltage sphere
iii) If the practical break down of air occurs at 30 KV/cm peak, calculate the disruptive voltage between the spheres. [5+5]

OR

5.a) Obtain the maximum charge conduction on a 3-phase EHVAC lines.

b) A charge of 10 μC is placed at a distance of 2 m from the center of a sphere of radius 0.5 m. Calculate the magnitude, polarity and location of point charge Q_2 which will make the sphere at zero potential. [5+5]

6.a) Describe the charge voltage diagram with corona and derive necessary expressions.

b) For r=1 cm , H=5 m , f=50 Hz , calculate corona loss according to Peek's formula when $E=1.1E_0$ and $\delta=1$. [5+5]

OR

7.a) Explain the generation and characteristics of audible noise.

b) The AN level of one phase of a 3-phase transmission line at a point is 50 dB. Calculate (i) the SPL in pascals (ii) if a second source of noise contributes 48 dB at the same location, calculate the combined AN level due to the two sources. [5+5]

8.a) Discuss the effect of high electrostatic field on biological organisms and human beings.

b) The following details of a truck parked parallel to a line are given. Find its capacitance. Length a = 8 m, height of body v =3m, width b=3 m , t=1.5 m. Height of line conductor H=13 m, dia of conductor = 0.04 m, distance of parking L=6m. [5+5]

OR

9.a) When the transmission line is terminated by the capacitive load, how do you find out the expressions of reflected voltage and current wave?

b) A 500 kV, 2 μsec, duration rectangular surge passes through a line having surge impedance of 350 Ω and approaches a station at which the concentrated earth capacitance is 3×10^3 pF. Calculate the maximum value of surge transmitted to the second line. [5+5]

10. A 400 kV line is 800km long and C =11.1 nF/km (Z_{00}=300 Ω). The voltages at the two ends are to be held at 400 kV at no load. Neglect resistance. Calculate
a) MVAR of shunt reaction to be provided at the two ends and at an intermediate station midway with all four reactors having equal reactance.
b) The A, B, C, D constants for the entire line with shunt reactors connected. [5+5]

OR

11.a) Explain TCR-FC type SVC with neat circuit and mention the improvements obtained with SVC.

b) Explain how you can control voltage using synchronous condensers. [10]

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