Printed Pages : 4   TEE-503

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2057   Roll No.

B. Tech.

(SEM. V) EXAMINATION, 2008-09
ELEMENTS OF POWER SYSTEM

Time : 3 Hours]   *[Total Marks : 100*

Note :   *Attempt all questions.*

1   Attempt any **four** parts :   5×4=20

    (a)   Draw single line-diagram of a three-bus system having generator G1 connected to bus-1 through transformer T1, generator G2 connected to bus-2 through transformer T2, four synchronous motors M1 to M4 connected to bus-3 through transformer T3, transmission lines TL1, TL2 and TL3 connected between buses 1-2, 2-3 and 1-3, respectively.

    (b)   What is the difference between isolator and circuit-breaker ?

    (c)   Compare the conductor requirement for $1-\phi$ AC system with $3-\phi$ AC system. Assume same maximum potential difference between conductor and earth.

    (d)   The cost of a $3-\phi$ overhead line having cross-section area 'a' cm² is $Rs. (500+2000\,a)$ per kilometre. Calculate the most economical current density for the conductor if the rate of interest and depreciation is 12%

per annum and the cost of energy wasted is 5 paise per kWh. The resistivity of conductor may be taken as 1.7 $\mu\Omega$-cm. Take load factor of 12%.

(e)   What advantages you get by using :

 (i) Stranded conductors

 (ii) Bundled conductors.

(f)   Explain with justification whether the following statement is TRUE on FALSE

"Skin effect increases effective resistance and reactance of conductor".

2 Attempt any **two** parts :   10×2=20

 (a) Determine capacitance of the arrangement shown in the figure when (i) the effect of earth is neglected and (ii) the effect of earth is considered. The heights of conductors from ground are 10 meters and radius of each of the conductor is 2 cm

 (b) The A, B, C, D constants of a three-phase transmission line are $A = D = 0.936 + j0.016$, $B = 33.5 + j138\ \Omega$ and

$$C = (-0.9280 + j901.223) \times 10^{-6}\ mho$$

The load at the receiving end is 40 MW at 200 kV with pf of 0.86 lagging. Find the magnitude of the sending end voltage, current, power, line frequency and the voltage regulation. Assume that the magnitude of the sending end voltage remains constant.

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(c) Obtain equivalent $-\pi$ model of a long transmission line.

3   Attempt any **two** parts :   10×2=20

(a) A conductor with 2.5 cm dia is passed centrally through a porcelain bushing having $t_r = 4$ and internal and external diameters of 3cm and 9cm, respectively. The voltage between the conductor and an earthed clamp surrounding the porcelain is 20 kV r.m.s. Determine whether corona will be present in the air-space round the conductor.

(b) Discuss advantages and disadvantages of corona. How can corona loss be minimized ?

(c) Determine the maximum voltage that the string of suspension insulators in the figure can withstand if the maximum voltage per unit is 17.5 kV.
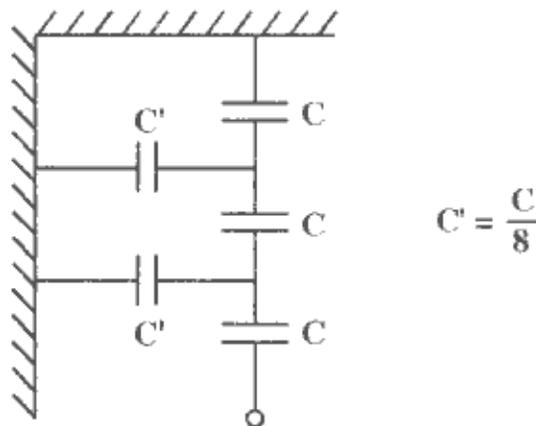
4   Attempt any **two** parts :   10×2=20

(a) Derive expressions for sag and tension in a power conductor strung between two supports at equal heights taking into account the wind and ice loading also.

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(b) Explain the necessity of a stringing chart for a transmission line and show how such a chart can be constructed.

(c) What is the purpose of using intersheaths in a cable ? Show that in a cable using two intersheaths the maximum stress in the (homogeneous) dielectric is reduced to $\dfrac{3}{(1+\alpha+\alpha^2)}$ of maximum stress without intersheaths where $\alpha = \dfrac{d_1}{d} = \dfrac{d_2}{d_1} = \dfrac{D}{d_2}$ (D and d are the interval sheath diameter and core diameter and d_1 and d_2 are the internal diameters of intersheaths 1 and 2 , respectively.

5   Attempt any **two** parts : $10 \times 2 = 20$

(a) Discuss following methods of neutral grounding :
   (i)   Peterson coil grounding
   (ii) Resonant grounding
   (iii) Solid grounding.

(b) Discuss the points which are considered while designing a transmission line.

(c) Discuss layouts, relative merits and demerits of different types of HVDC links.

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