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CS/B.Tech(EE)/SEM-5/EE-502/2009-10

2009

POWER SYSTEM – I

Time Allotted : 3 Hours | Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) Corona loss can be reduced by using

a) solid conductor of diameter 'd'

b) hollow conductor of diameter '$d + \delta d$'

c) bundle conductor

d) both (a) and (b)

e) both (b) and (c).

ii) Tower footing resistance of a transmission tower should be

a) as high as possible b) as low as possible

c) moderately high d) moderately low.

iii) By increasing the transmission voltage double of its original value, the same power can be despatched keeping the line loss

a) equal to its original value

b) half of original value

c) double the original value

d) one-fourth of original value.

iv) Characteristics of an overhead line is usually in the range of

a) 100 ohms - 200 ohms

b) 200 ohms - 300 ohms

c) 400 ohms - 500 ohms

d) 0 ohm - 100 ohms.

v) The dielectric strength of air under normal condition is about

a) 100 kV_p / cm b) 21·1 kV_p / cm

c) 30 kV_p / cm d) 200 kV_p / cm.

vi) A synchronous compensator absorbs inductive reactive power. It is

a) over excited

b) normally excited

c) under excited

d) none of these.

vii) To obtain the maximum value of stress in cables, the ratio (R/r) should be

a) 2·13 b) 2·718

c) 1·96 d) 1·5

viii) Poll mounted substations are used in

a) primary transmission system

b) secondary transmission system

c) primary distribution system

d) secondary distribution system.

ix) As the load factor of a generating plant increases, the generation cost per kWh generated

a) decreases

b) increases

c) remains same

d) none of these.

x) In a transmission line having negligible resistance, the surge impedance is

a) $\sqrt{L + C}$ b) $\sqrt{C/L}$

c) $\sqrt{\frac{1}{LC}}$ d) $\sqrt{L / C}$.

xi) Transposition of transmission line is done to

a) reduce line loss

b) reduce skin effect

c) balance line voltage drop

d) reduce corona.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Discuss the effect of wind and ice on sag.

3. What is arcing ground ? How it can be minimized ?

4. Explain the method of capacitance grading of an underground cable.

5. Describe the following briefly :

   a) Pin type insulator

   b) Suspension type insulator

   c) Post type insulator.

6. What is a stringing chart ? What is its utility ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What is corona ? Explain briefly the factors which affect corona.

   b) Find the disruptive critical and visual corona voltages of a grid line operating at 132 kV. The following data is given :

   Conductor dia = 1·9 cm, conductor spacing = 3·81 m, temperature = 44°C, barometric pressure = 73·7 cm, conductor surface factor : fine weather = 0·8, rough weather = 0·66

8. a) Write down the general aspects of power distribution system.

   b) A 2-wire D.C. distributor, 800 metre long, is fed from both ends. It is uniformly loaded at the rate of 1·1 A/m run. Calculate the voltage at the feeding points *A* and *B* if the minimum potential of 230 V occurs at point *C* at a distance of 500 metres from the end *A*. Resistance of the distributor is 0·1 Ω/km (go and return)

9. What is sag ? What factors affects sag ? An overhead line erected across a span of 250 metres on level supports. The conductors has a diameter of 1·42 cm and has a dead weight of 1·09 kg/m. The line is subjected to wind pressure of 37·8 kg/square metre of projected area. The radial thickness of ice is 1·25 cm line is carried by insulator string 1·43 km long. Calculate : (i) sag in inclined direction (ii) sag in vertical direction (iii) height of lowest cross arm to give minimum ground clearance of 7·62 m under bad weather condition. Assume one cubic metre of ice weight 913·5 kg and maximum stress of 1050 kg/square cm.

10. The daily load of an industrial corner is as follows :

    100 kW for 9 hours

    125 kW for 6 hours

    50 kW for 7 hours

    5 kW for 2 hours

    The tariff rate is Rs. 800 per kW of maximum demand per year plus Rs. 2·50 per kWh. Determine the energy consumption per year (365 days) and yearly bill.

11. Write short notes on any *three* of the following :

    a) Earthing of substation

    b) Choice of voltage for transmission line

    c) Ferranti effect

    d) Power circle diagram

    e) Two part tariff.