8E4109

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B. Tech. (Sem. VIII) (Main/Back) Examination, April/May-2012
Electrical Engg.
8EE1 EHV AC/DC Transmission
Common - 8EE1, 8EX1

Time : 3 Hours] [Total Marks : 80
[Min. Passing Marks : 24

*Attempt any **five** questions.*
*Selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)
1. Nil 2. Nil

UNIT - I

1 (a) What is series compensation ? How it is useful for EHV AC transmission system ? What are the advantages of series compensation ? Explain the problems associated with its use. **1+1+3+3**

(b) A point charge Q = 10^{-6} coulomb $(1\mu C)$ is kept on the surface of a conducting sphere of radius r = 1 cm, which can be considered as a point charge located at the centre of the sphere. Calculate the field strength and potential at a distance of 0.5 cm from the surface of the sphere. Calculate the field strength and potential at a distance of 0.5 cm from the surface of the sphere. Also find the capacitance of the sphere E_r=1. **5**

(c) The field strength on the surface of a sphere of 1 cm radius is equal to the corona-inception gradient in air of 30 kV/cm. Find the charge on the sphere. **3**

OR

1 (a) Explain the estimation of conductance surface gradient for EHV AC transmission lines. **8**

(b) A 132 kV line with 1.956 cm diameter conductors is built so that corona takes place if the line voltage exceeds 210 kV (r.m.s). If the value of potential gradient at which ionisation occurs can be taken as 30 kV per cm, find the spacing between the conductors. (Assume the line is 3-phase). 8

UNIT - II

2 (a) Explain flat tie line load control and the line load bias control method of load frequency control for the interconnected power system.

8

(b) A three phase overhead transmission line has per phase resistance and reactance of $6\,\Omega$ and $20\,\Omega$ respectively. The sending end voltage is 66 kV while the receiving end voltage is maintained at 66 kV by a synchronous phase modifier. Determine the kVAR of modifier when the load at the receiving end is 75 MW at power factor 0.8 lagging, also determine the maximum load that can be transmitted.

8

OR

2 (a) Explain the speed governing characteristics of generating unit and parallel operation of generations.

8

(b) Two similar 4000 kVA alternators operate in parallel. The governor of first machine is such that frequency drops from 50 Hz on the load to 47.5 Hz on full load. The corresponding drop for the second machine is 50 Hz to 48 Hz. How will be a load of 6000 kW be shared by the two machines ? What will be the system frequency at this load ?

8

UNIT - III

3 (a) What is the role of reactive power on voltage and voltage regulation ? What are the components which are responsible for generation and absorption of reactive power in the power system ? Explain.

5+3

(b) What is shunt compensation ? What is the role of shunt compensation in power system ? How it is different from series compensation ? Explain.

1+2+3

(c) Why are unswitched shunt reactors connected to terminals of a transmission line ?

2

OR

3 (a) Explain the various types of thyristorised static VAR compensator used for voltage control in EHV transmission system.

8

(b) A 400 kV line is 800 km long. Its inductance and capacitance per km are l = 1 mH/km and C = 11.1nF/km (Z_{oo} = 300 ohms). The voltages at the two ends are to be held at 400 kV at no load. Neglect resistance. Calculate :

(i) MVAR of shunt reactors to be provided at the two ends and at an intermediate station midway with all four reactors having equal reactance. (use 6°/100 km)

(ii) The A,B,C,D constants for the entire line with the shunt reactors connected.

4+4

UNIT - IV

4 (a) Explain the principle of operation of FACT system in long transmission system, with its schematic diagram. What are its limitations ?

3+5

(b) How the STATCOM is used as a FACT controller ? Explain in detail.

8

OR

4 (a) What are the controllable variables in FACTs ?

8

(b) Explain the UPFC used for power system.

8

UNIT - V

5 (a) Briefly state the principle of HVDC system operation. What are the technical and economic advantages of HVDC transmission over HVAC transmission system ?

2+6

(b) What types of DC links are used in HVDC transmission system ? Explain the applications of each of these links.

2+6

OR

5 (a) Explain the principle of DC link control and converter control characteristics. What are the applications of HVDC transmission systems ?

6+2

(b) Explain the basic scheme and equipment of converter station. Also write a short note on ground return system.

5+3
