SRK/KW/14/7065

Faculty of Engineering & Technology

Fifth Semester B.E. [Electrical Engg.] (C.B.S.) Examination

ELECTRICAL POWER SYSTEM—I

Time : Three Hours] [Maximum Marks : 80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Due credit will be given to neatness and adequate dimensions.

(3) Assume suitable data wherever necessary.

(4) Illustrate your answers wherever necessary with the help of neat sketches.

(5) Use of slide rule, Logarithmic tables, Non-programmable Calculator, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.

1. (a) Explain the advantages and limitations of high and extra high voltage levels of transmission. Give the range of voltages to distinguish clearly as HV, EHV and UHV levels. 7

(b) List out the various equipments used in substation mentioning function of each equipment. Compare indoor and outdoor type of substations. 8

OR

2. Write short notes on :
   (i) Complex power 4
   (ii) Load and their characteristics 4
   (iii) Voltage and frequency dependence of loads. 5

3. (a) Derive the formula for inductance of a composite conductor lines and hence define GMD and GMR. 6

   (b) Calculate inductance per phase for a 3 ph double circuit line whose phase conductors have a radius of 1.5 cm with horizontal conductor spacing as shown in Fig. 3(b) 7

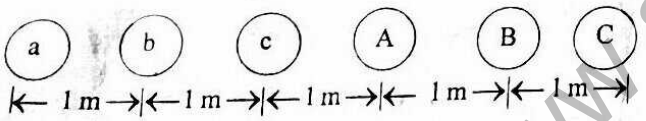

Fig 3 (b)

OR

4. (a) What are the advantages of per unit impedances ? Show that per unit impedance for the transformer derived from either side gives same values. 6

(b) Sample power system network is shown in Fig. 4(b). The rating of different components is :

G : 40 MVA, 25 kV, X" = 20%

M : 50 MVA, 12.2 kV, X" = 30%

T_1 : 60 MVA, 32/220 kV, X" = 15%

T_2 : 30 MVA, 220/11 kV, X" = 12%

Line reactance = 800 Ω.

Assume generator rating as base values. Draw per unit reactance diagram. 7

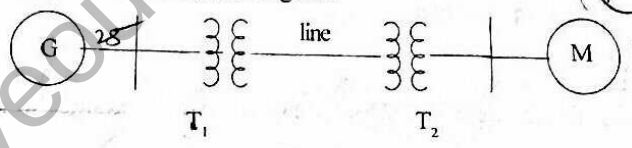

Fig 4(b)

5. (a) What are the various types of distribution schemes ? Compare their relative merits and demerits. 7

   (b) A 3-ph metal sheathed cable 1 km long gave the following results on a test for capacitance :

   (i) Capacitance between two conductors bunched with sheath and third conductor is 0.5 μF.

   (ii) Capacitance between bunched conductors and sheath is 1 μF. With the sheath insulated, find the capacitance :

   (a) between any two cores

(b) between any two bunched conductors and third conductor.

Also calculate the charging current per km per phase when connected to 11 kV, 50 Hz supply. 7

OR

6. (a) Discuss the significance of string efficiency. What are various methods to improve the string efficiency ? 7

(b) Each conductor of a 33 kV, 3-ph system is suspended by a string of 3 similar insulators. The capacitance of each disc is 9 times the capacitance to ground. Calculate the voltage across each insulator. Determine the string efficiency. 7

7. (a) How can transmission lines be classified ? With the help of phasor diagram derive generalised constant for nominal-π circuit representation. 6

(b) A 3-ph line has R = 5.31 Ω and L = 0.0176 H. Power transmitted at 33 kV, 50 Hz from one end and load at receiving end is 3600 KW at 0.8 pf lagging. Find line current, voltage at receiving end and transmission efficiency assuming it to be a short line. 7

OR

8. (a) Explain physical interpretation of long length lines. 6

(b) Using nominal-π method, find V_s and voltage regulation for 250 km, 3-ph, 50 Hz transmission line delivering 25 MVA at 0.8 pf lagging to a balanced load at 132 kV. The line conductors are placed equilaterally 3 m apart. The conductor resistance is 0.11 Ω/km and effective diameter is 1.6 cm. 7

9. (a) Explain the significance of load flow analysis in power system. 6

(b) Classify various types of buses in power system for load flow study and explain their characteristics. 7

OR

10. (a) Explain the important characteristics of static load flow equations. 6

(b) Write short note on frequency and voltage as system state indicators. 7

11. (a) Explain in brief the principle of working of speed governing system for a turbo generator. 7

(b) Two alternators rated 200 MW and 400 MW are operating in parallel. Governors setting on the machine are such that they have 4% and 5% droop respectively from no load to full load. Determine load taken by each generator for a total load of 600 MW and system frequency at this load if no load frequency is 50 Hz.

OR

12. Write short notes on :

(i) Automatic voltage regulator for turbo generators 5

(ii) Reactive power sharing between two parallel alternators 5

(iii) Concept of real and reactive power control. 4