S.E. electrical – sem – II
Nov – Dec – 2012, 2008 pattern

Total No. of Questions—12] [Total No. of Printed Pages—7

Seat No.	

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S.E. (Electrical) (II Sem.) EXAMINATION, 2012

POWER SYSTEM—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define and explain the importance of the following terms in generation : [8]

(*i*) Connected load

(*ii*) Maximum demand

(*iii*) Demand factor

(*iv*) Average load.

P.T.O.

(b) Discuss the advantages of interconnected grid system. [8]

Or

2. (a) A base load station having a capacity of 18 MW and a standby station having a capacity of 20 MW share a common load. Find the annual load factors and plant capacity factors of two power stations from the following data :

Annual standby station output = 7.35×10^6 kWh

Annual base load station output = 101.35×10^6 kWh

Peak load on standby station = 12 MW

Hours of use by standby station/year = 2190 hours. [8]

(b) Describe the desirable characteristics of a tariff. [8]

3. (a) Discuss the functions and principle of operation of automatic voltage regulator. Name different types of voltage regulators. [8]

(b) Each conductor of a 3-phase high-voltage transmission line is suspended by a string of 4 suspension type disc insulators. If the potential difference across the second unit from top is 13.2 kV and across the third from top is 18 kV, determine the voltage between conductors. [8]

Or

4. (*a*) Discuss the necessity of excitation system used for alternators. Explain one of the types of excitation system used for alternators in brief. [8]

(*b*) Define string efficiency. State different methods used for improving the string efficiency. Derive the expression for voltage distribution across the units of a string of suspension insulators. [8]

5. (*a*) Derive an expression for the inductance of a three-phase overhead transmission line when conductors are symmetrically spaced. [8]

(*b*) The three conductors of a 3-phase line are arranged at the corner of a triangle of sides 2 m, 2.5 m and 4.5 m. Calculate the inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1.24 cm. [6]

(*c*) What is skin effect ? Why is it absent in the D.C. system ? [4]

Or

6. (*a*) Explain the concept of GMD and GMR. [6]

(*b*) What is meant by transposition of conductors in an overhead line ? Why is it essential ? How is it carried out ? [6]

(*c*) A three-phase 50 Hz overhead transmission line consists of three conductors each of diameter 0.3 cm. The spacing between the conductors is as follows :

A – B = 4 m, B – C = 4.5 m, C – A = 5.2 m.

Find the inductance and inductive reactance per phase per km of the line. [6]

SECTION II

7. (*a*) Derive an expression for capacitance per phase of a three-phase overhead transmission line with unsymmetrical spacing of conductors assuming transposition. [10]

(*b*) A single phase line is having two single standard conductors and radius of each 0.328 cm. The conductors are separated 3 m apart and 7.5 m above ground. Calculate : [8]

(*i*) Capacitance to neutral/km without considering earth effect.

(*ii*) Capacitance to neutral/km with considering earth effect.

Or

8. (*a*) Derive the equation for capacitance per km of a single phase overhead transmission line having distance 'D' between conductors and '*r*' is the radius of each conductor. [6]

(*b*) Explain the "Method of Images" in determing the effect of earth on the capacitance calculation for overhead transmission lines. [6]

(*c*) A three-phase, 50 Hz, 132 kV overhead line has conductor placed in horizontal plane 4 m apart. Conductor diameter is 2 cm. If the line length is 100 km, calculate :

(*i*) capacitance of each conductor to neutral

(*ii*) charging current per phase.

Assuming complete transposition. [6]

9. (*a*) Express the relationship for the sending end voltage and current in terms of receiving end voltage and current for a medium length transmission line with Nominal 'π' method of representation. Evaluate the generalized circuit constants. [8]

(*b*) A three-phase overhead long transmission line has total series impedance per phase (200 ∠ 80°) Ω and total shunt admittance of (0.0013 ∠ 90°) (mho/ph). The line deliver a load of 80MW at 0.8 p.f. lagging and 220 kV between lines. Determine A, B, C and D parameters. [8]

Or

10. (*a*) Give classification of transmission lines based on length. Explain the influence of power factor on the performance of a transmission line. [8]

(*b*) Derive the hyperbolic expressions for sending end voltage and current in terms of receiving end voltage and current for a long transmission line. [8]

11. (*a*) What are the different factors affecting sag of a transmission line ? Derive an expression for sag when supports are at equal level. [8]

(*b*) A transmission line has a span of 150 m between level supports. The conductor has cross-sectional of 2 cm^2. The tension in the conductor is 2000 kg. If the specific gravity of the conductor material is 9.9 gm/cm^3 and wind pressure is 1.5 kg/m length, calculate the sag. What is vertical sag ? [8]

Or

12. (*a*) Derive an expression for maximum and minimum dielectric stress in a single core cable. [8]

(*b*) How are the effect of wind and ice loading taken into account while determing the resultant loading of the conductors ? [4]

(*c*) Explain different types of cable. [4]