Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech.

Branch	**: EEE**	**Semester**	**: 4th**
Title of the Course	**: Power Systems-I**	**Course Code**	**: EE 253**

Time: 3 Hours **Maximum Marks: 50**

Note : 1. Do not write anything on the question paper except Roll number

2. Assume any data suitably if found missing

Section A: Answer all 10 multiple choice questions. Each question carries 01 mark. [10×1=10]

A1. The connected load is generally ..... than the maximum demand.

A2. The lesser the diversity factor, the ..... is the cost of generation of power.

A3. Base load occurs on power station for ..... hours in a day.

A4. The lesser the diversity factor ..... is the cost of generation of power.

A5. A consumer who consumes more electrical energy should pay ..... fixed charges per unit.

A6. If shunt capacitance is reduced, then string efficiency is .....

A7. The most commonly used material for insulators of overhead line is .....

A8. The d.c. resistance of a line conductor is ..... than it's a.c. resistance.

A9. If the capacitance between two conductors of a 3-phase line is $4\mu F$, then capacitance of each conductor to neutral is .....

A10. The overhead line is ..... flexible than underground system.

Section B: Answer any 4 questions. Each question carries 5 marks. [4×5=20]

B1. Explain at least three types of geo thermal power plants with the help of neat diagram. What are the advantages and disadvantages of each?

B2. A certain 3-phase equilateral transmission line has a total corona loss of *53 kW* at *106 kV* and a loss of *98 kW* at *110.9 kV*. What is the disruptive critical voltage? What is the corona loss at *113 kV*?

B3. Two conductors of a single phase line, each of *2 cm* diameter, are arranged in a vertical plane with one conductor mounted *1 m* above the other. A second identical line is mounted at the same height as the first and spaced horizontally *0.25 m* apart from it. The two upper and the two lower conductors are connected in parallel. Determine the *inductance per km* of the resulting double circuit line.

B4. Draw the schematic diagram of a modern steam power station and explain its operation.

B5. Draw the single line diagram of a 132/33 kV substation and explain the functioning of each apparatus.

Section C: Answer any 2 questions. Each question carries 10 marks. **[2×10=20]**

C1. A string of six insulators (suspension type) is to be graded to obtain uniform distribution of voltages across the string. If the capacitance of top unit is 10 times the capacitance to ground of each unit, determine the capacitance of the remaining five units.

C2. Taking the assumption of same maximum voltage between line conductors, the same power P to be transmitted, same route length l of the line, same efficiency of transmission, no power loss in neutral conductor; Compare the volume of conductor required in D C 2 wire system with one wire earthed, D C 2 wire with midpoint earthed, single phase 2 wire, three phase 3 wire star connected, three phase 4 wire systems.

C3. The maximum demand and annual load factor of a generating station are *100 MW* and *40%* respectively. The annual capital charge for the transmission and distribution respectively are *Rs.* 2.5×10^6 and *Rs.* 2×10^6 and their respective diversity factors are *1.2* and *1.3*. Generating cost, inclusive of station capital cost is *Rs. 100 per annum per KW demand* plus *5 paisa per KWhr* transmitted. The efficiency of transmission and distribution systems are *95%* and *85%* respectively. Determine the *yearly cost per KW demand* and *cost per KWhr* supplied (a) at the substation, (b) at the consumer premises.