GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2022

POWER SYSTEM - I

EE502

TIME ALLOTTED: 3Hours **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)

Answer any *ten* from the following, choosing the correct alternative of each question: **10×1=10**

		Marks	CO No
1. i)	Suspension type insulators are used for voltage beyond a) 33 KV b) 400 KV c) 11 KV d) 66 KV	1	CO3
ii)	In any transmission line AD – BC = ? a) 0 b) 3 c) 1 d) 5	1	CO1
iii)	The first nuclear power plant in the world was commissioned in a) U.S.A b) U.S.S.R c) England d) India	1	CO1
iv)	If the length of the cable is doubled, its capacitance is a) Doubled b) Halved c) Quadrupled d) None of these	1	CO1
v)	The economic size of conductor is determined by a) Kelvin's law b) Kirchoff's law c) Faraday's law d) None of these	1	CO1

vi) When the conductors of a three phase circuit are not spaced equilaterally, the transposition is done to — 1 — CO3
a) Decrease the line inductance per phase
b) Minimize the effect of adjoining communication circuit
c) Balance the three phases of the circuit
d) Both (a) and (b)

vii) Which part of thermal power plant causes maximum energy losses? — 1 — CO2
a) Boiler
b) Alternator
c) Condenser
d) Ash and unburnt carbon

viii) The amount of electrical energy that can be generated by a hydroelectric power plant depends upon _____ — 1 — CO2
a) Head of water
b) Quantity of water
c) Specific weight of water
d) Efficiency of Alternator

ix) The most suitable practical value of primary distribution is? — 1 — CO1
a) 66 kV
b) 6.6 kV
c) 230 V/ 400 V
d) 22 kV

x) Transmission efficiency increases as — 1 — CO1
a) Voltage and power factor both increase
b) Voltage and power factor both decrease
c) Voltage increases but power factor decreases
d) Voltage decreases but power factor increases.

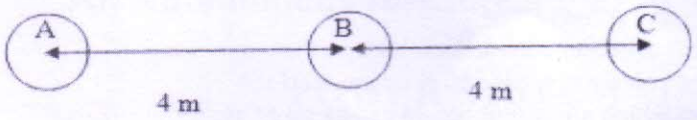
xi) ACSR in an overhead transmission line stands for — 1 — CO1
a) Alloy Copper Steel Reinforced
b) Aluminum Conductor Steel Reinforced
c) All Cooper Steel Reinforced
d) None of these

GROUP – B
(Short Answer Type Questions)

(Answer any *three* of the following) **3 x 5 = 15**

		Marks	CO No
2.	Define the term 'String Efficiency' in connection with Suspension type insulators. What are the different methods of improving String efficiency?	5	CO1

3. The three conductors of a three phase balanced lines are arranged in a horizontal plane. The diameter of each conductor is 2 cm — 5 — CO1



Phase sequence is A-B-C. Consider A phase as the reference. Find the magnitude of the capacitance C_{An} in μF/km (Lines are not transposed)

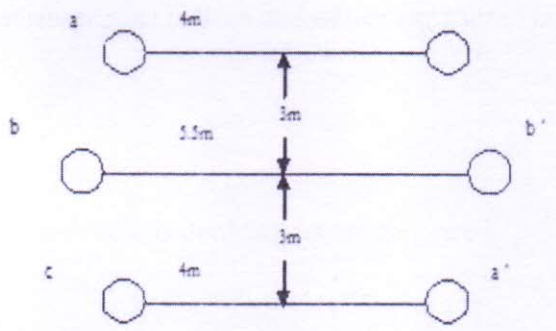
4. What do you mean by skin effect? On which factor does it depend? — 5 — CO3

5. Ferranti Effect explains with phasor diagram. — 5 — CO1

6. Find the inductance of a 3- phase overhead line for unsymmetrical spacing. — 5 — CO1

GROUP – C
(Long Answer Type Questions)
(Answer any *three* of the following) **3 x 15 = 45**

		Marks	CO No
7. a.	Explain in brief, the different components of a Nuclear Power Plant and their function.	8	CO2
b.	Draw the Schematic Diagram of a Thermal Power Plant.	7	CO2
8. a.	Derive the expression for Sag when the Tower supports are at Different Levels.	3	CO1
b.	Find the inductance of per phase per km of a double circuit line shown below.	7	CO1



The conductors are transposed and are of radius 0.75 cm each. The phase sequence is ABC

c. Each conductor of a 3-phase overhead transmission line is suspended from a cross- arm of a steel tower by a string of four suspension insulators. The voltage across the second unit is 15.0 kV and across the third 27.0 kV. Find the voltage between conductors and string efficiency. — 5 — CO1

9.	a.	What do you mean by corona?	3	CO1
	b.	Discuss the methods of reducing corona effect.	5	
	c.	A 132 KV line with 1.956 cm diameter conductor 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 ionization occurs can be taken as 30 KV per cm, find the spacing between the conductors.	7	
10.	a.	What is meant by the term "tariff"?	3	CO3
	b.	Explain the following: i. Block rate tariff ii. Power factor tariff. iii. Three-part tariff	6	CO3
	c.	Draw the block diagram of Steam Power Plant.	6	
11.	a.	Derive an expression for the loop inductance of a single phase line.	7	CO2
	b.	A transmission line over a hillside where the gradient is 1:20, is supported by two 22 m high towers with a distance of 300 m between them. The lowest conductor is fixed 2 m below the top of each tower. Find the clearance of the conductor from the ground. Given that conductor weights 1 kg/m and the allowable tension is 1500 kg.	8	CO3