

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-IV EXAMINATION – WINTER 2025****Subject Code:3140914****Date:26-11-2025****Subject Name:Power System- I****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
<b>Q.1</b>	(a) Define: 1) load factor, 2) Diversity factor, 3) Electricity tariff	<b>03</b>
	(b) Draw configuration of bundle conductor and analyze effect of bundle conductor on transmission line.	<b>04</b>
	(c) Differentiate Steam power station and Hydro power station	<b>07</b>
<b>Q.2</b>	(a) Represent the transmission line 1) with distributed parameters 2) with lumped parameters.	<b>03</b>
	(b) Explain various components of wind energy conversion system with diagram.	<b>04</b>
	(c) Compare Stand-alone PV system configurations, and Grid-connected PV systems.	<b>07</b>
<b>OR</b>		
	(c) Draw Schematic arrangement of nuclear power station and explain function of each block.	<b>07</b>
<b>Q.3</b>	(a) Explain the term transposition of conductors with diagram and necessity for transposition of conductors	<b>03</b>
	(b) An overhead transmission line has a span of 220 m. The conductor weight is 0.7 kg/m. Calculate the maximum sag, if the ultimate strength of conductor is 5760 kg. Assume factor of safety equal to 2.	<b>04</b>
	(c) Define sag in case of overhead transmission line. Derive expression to calculate sag when supports of transmission line are at equal Ground level	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) State and explain concept of internal flux linkage in case of overhead transmission line.	<b>03</b>
	(b) Define and Explain String efficiency. State methods of improving string efficiency. Discuss any one.	<b>04</b>
	(c) Each line of 3-phase system is suspended by a string of 3 similar insulators. If voltage across the line unit is 8KV, calculate the line to neutral voltage. The shunt capacitance between each insulator and earth is $1/9^{\text{th}}$ of the self capacitance of insulator. Find the string efficiency.	<b>07</b>
<b>Q.4</b>	(a) Explain self GMD and Mutual GMD	<b>03</b>
	(b) Derive expression for capacitor of single-phase transmission line.	<b>04</b>
	(c) In a 3-phase transmission line, three conductors are spaced at equal distance from each other i.e. 2.5 m. The diameter of conductor is 1.3 cm. find the inductance per km length of line.	<b>07</b>
<b>OR</b>		
<b>Q.4</b>	(a) Explain term “grading of cable”	<b>03</b>
	(b) Apply concept of capacitance for grading of cable.	<b>04</b>

- (c) Derive expression for inductance of Double circuit transmission line. **07**
- Q.5** (a) Draw single line diagram of 66/11 kV substation label each equipment. **03**  
(b) Describe pole mounted transformer in particle application. **04**  
(c) Explain following **07**  
1) Voltage transformer earthing,  
2) Grounding transformer.
- OR**
- Q.5** (a) Discuss disadvantage of low power factor. **03**  
(b) List the different methods of neutral grounding. Explain solid grounding with its advantage and disadvantages **04**  
(c) Evaluate an equation for most economical value of power factor which may be attained by a consumer. **07**

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**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-IV (NEW) EXAMINATION – WINTER 2024****Subject Code:3140914****Date:29-11-2024****Subject Name: Power System- I****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Write the advantages and disadvantages of hydro power plant. **03**  
 (b) What is a Solar Collectors? Explain its types. **04**  
 (c) Define tariff. Discuss the types of tariff in details. **07**
- Q.2** (a) Write the advantages of high voltage transmission system. **03**  
 (b) Draw and explain V-I Characteristics of Solar Cell. **04**  
 (c) Explain the types of distribution systems with necessary diagrams. **07**
- OR**
- (c) Define power factor. Explain the methods of power factor improvement. **07**
- Q.3** (a) Write the disadvantages of low power factor. **03**  
 (b) Compare horizontal axis wind turbine and vertical axis wind turbine. **04**  
 (c) Obtain an equation of Sag in overhead lines **07**  
 (i) When supports are at equal level  
 (ii) When supports are at unequal level  
 (iii) During effect of wind and ice loading
- OR**
- Q.3** (a) Define: Skin effect and Proximity effect. **03**  
 (b) Explain the methods of increasing string efficiency. **04**  
 (c) A high voltage transmission has distance between the leveled tower of 150 meter. Tension in the conductor is 2100 kg. Other data is as follows. **07**  
 (i) Wind pressure 2 kg/meter length of conductor ( $W_w$ )  
 (ii) Specific gravity of material of conductor = 10 gram/cm<sup>3</sup>  
 (iii) C.S. are of the conductor = 2 cm<sup>2</sup>  
 Calculate (a) Sag and (b) Vertical sag.
- Q.4** (a) Give the concept of GMR and GMD. **03**  
 (b) Derive an expression for the loop inductance of a single-phase line. **04**  
 (c) Derive the relation of inductance of 3-phase with symmetrical spacing. **07**
- OR**
- Q.4** (a) What do you mean by transposition of line? What is its effect on the performance of the line? **03**  
 (b) Explain the effect of earth on capacitance. **04**  
 (c) A 3-phase, 50 Hz transmission lines are arranged at the corners of a triangle, the sides of which are 1m, 1.3m and 2m. Calculate the capacitance per km of the line, when the conductors are transposed. The conductors have 1.5 cm diameter. **07**
- Q.5** (a) Write the classification of cables according to voltage levels. **03**  
 (b) Explain the Grading of cables. **04**  
 (c) Define substation. Explain the classification of substation considering different ways. **07**

**OR**

- Q.5**
- (a)** List out equipments which are used in transformer substation. **03**
  - (b)** Compare overhead system with underground transmission system. **04**
  - (c)** What are the different methods of neutral grounding? **07**  
Explain resistance grounding with necessary diagram.

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**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2023****Subject Code:3140914****Date:29-01-2024****Subject Name: Power System- I****Time: 10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
<b>Q.1</b>	(a) Name the different types of line supports.	<b>03</b>
	(b) For a steam power plant, explain location and functions of Condenser (ii) Boiler (iii) Super heater (iv) Alternator	<b>04</b>
	(c) Give a typical layout of power system between generation and use of electrical power.	<b>07</b>
<b>Q.2</b>	(a) Discuss the advantages and limitations of High Transmission Voltage.	<b>03</b>
	(b) Classify different Substations in detail.	<b>04</b>
	(c) Define and explain string efficiency. What are the various methods of improving it?	<b>07</b>
<b>OR</b>		
	(c) A transmission line has a span of 150 m between level supports. The conductor has cross sectional area of 2 cm <sup>2</sup> . The tension in the conductor is 2000 Kg. If the specific gravity of the conductor material is 9.9 gm/c.c. and wind pressure is 1.5 Kg/m length, calculate the sag. What is the vertical sag?	<b>07</b>
<b>Q.3</b>	(a) Enlist advantages and disadvantages of Gas power plant.	<b>03</b>
	(b) Explain working principle of solar photovoltaic cell.	<b>04</b>
	(c) Write short note on Nuclear Reactor.	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) Write site selection criteria for wind mills.	<b>03</b>
	(b) What do you understand by base load plant and peak load plant?	<b>04</b>
	(c) Explain with diagram elements of hydro-electric power plant.	<b>07</b>
<b>Q.4</b>	(a) Classify underground cables.	<b>03</b>
	(b) Explain self GMD and mutual GMD.	<b>04</b>
	(c) Derive equation for capacitance of single phase two wire line.	<b>07</b>
<b>OR</b>		
<b>Q.4</b>	(a) Explain with neat sketch the construction of cable.	<b>03</b>
	(b) Name the different types of insulators used in transmission system. Explain any one.	<b>04</b>
	(c) Derive equation for inductance of three phase line with unsymmetrical spacing. Assume transposition	<b>07</b>
<b>Q.5</b>	(a) Why is earthing necessary in power system? How can it be classified?	<b>03</b>
	(b) Define power factor. Discuss different methods of power factor improvement.	<b>04</b>

- (c) Discuss with neat sketches, different connection schemes of distribution systems. **07**

**OR**

- Q.5** (a) What is tariff? Discuss maximum demand tariff. **03**  
(b) Enumerate types of neutral earthing and explain any one with neat sketch. **04**  
(c) A 2-wire dc street mains AB, 600 m long is fed from both ends at 220 V. Loads of 20A, 40A, 50A and 30A are tapped at distances of 100m, 250m, 400m and 500m from the end A respectively. If the area of X-section of distributor conductor is  $1 \text{ cm}^2$ , find the minimum consumer voltage. Take  $\rho = 1.7 \times 10^{-6} \Omega \text{ cm}$ . **07**

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**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-IV(NEW) EXAMINATION – WINTER 2022****Subject Code:3140914****Date:19-12-2022****Subject Name:Power System- I****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	<b>MARKS</b>
<b>Q.1 (a)</b> Define: i) load curve ii) load duration curve iii)base load	<b>03</b>
<b>(b)</b> Illustrate hydro power station with neat diagram.	<b>04</b>
<b>(c)</b> Solve an equation for most economical value of power factor which may be attained by a consumer.	<b>07</b>
<b>Q.2 (a)</b> Show that in string of suspension insulators, the disc nearest to conductor has the highest voltage across it.	<b>03</b>
<b>(b)</b> Explain construction and working of DFIG.	<b>04</b>
<b>(c)</b> In a 66 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self-capacitance of each insulator, Calculate (i) the distribution of voltage over 3 insulators and (ii) string efficiency.	<b>07</b>
<b>OR</b>	
<b>(c)</b> Obtain an equation of sag in overhead lines.	<b>07</b>
i)When supports are at equal level.	
ii) When supports are at unequal level.	
iii)during effect of wind and ice loading	
<b>Q.3 (a)</b> Define: Transposition of conductor & list out its advantages.	<b>03</b>
<b>(b)</b> Calculate the capacitance of a 100 km long 3-phase, 50 Hz overhead transmission line consisting of 3 conductors, each of diameter 4 cm and spaced 2.5 m at the corners of an equilateral triangle.	<b>04</b>
<b>(c)</b> Evaluate an expression for electric potential	<b>07</b>
(i) at a charged single conductor	
(ii) at a conductor in a group of charged conductors	
<b>OR</b>	
<b>Q.3 (a)</b> Define: bundle conductor & list out its advantages.	<b>03</b>
<b>(b)</b> Derive an expression for the loop inductance of a single phase line.	<b>04</b>
<b>(c)</b> Deduce an expression for line to neutral capacitance for a 3-phase overhead transmission line when the conductors are	<b>07</b>
(i) symmetrically placed	
(ii) unsymmetrically placed but transposed	
<b>Q.4 (a)</b> Compare the merits and demerits of underground system versus overhead system.	<b>03</b>
<b>(b)</b> Explain desirable characteristics of insulating materials used in cables.	<b>04</b>
<b>(c)</b> Explain with neat sketch the construction of cables.	<b>07</b>
<b>OR</b>	
<b>Q.4 (a)</b> Classify cables.	<b>03</b>
<b>(b)</b> Explain methods of grading.	<b>04</b>

- (c) Determine condition for most economic size of conductor in an underground cable. **07**
- Q.5** (a) Enlist various equipment's used in substation **03**  
(b) Explain single bus bar arrangement in substation with neat diagram. **04**  
(c) Distinguish between a.c and d.c transmission. **07**
- OR**
- Q.5** (a) Define: Neutral grounding. List out advantages of neutral grounding. **03**  
(b) Explain transformer grounding. **04**  
(c) Evaluate an equation for the volume of conductor in case of 3-phase 3-wire system and 3-phase 4-wire system in overhead power transmission. **07**

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