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**B.TECH**  
**(SEM V) THEORY EXAMINATION 2021-22**  
**POWER SYSTEM - I**

**Time: 3 Hours****Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 10 = 20**

- a. What is Demand factor? Why is it important?
- b. For the same maximum demand, if load factor is decreased, then what will be the cost of energy?
- c. What are the limitations of Kelvin law?
- d. What is Ferranti Effect?
- e. How are voltage distribution and the string efficiency affected by rain?
- f. What is the importance of sag in transmission line?
- g. Differentiate between GMD and GMR.
- h. Why the effect of ground on the line capacitance can be neglected?
- i. Why single core cables are usually not provided with armouring.
- j. How do voids in the insulation cause breakdown of the cable?

**SECTION B****2. Attempt any three of the following: 10 x 3 = 30**

- a. What are the conventional and non conventional sources of energy, Explain with examples.
- b. Draw single line diagram of a Four-bus system having generator  $G_1$  connected to bus-1 through transformer  $T_1$ , generator  $G_2$  connected to bus-2 through Transformer  $T_2$ , Load A and Load B connected to bus-3 through transformer  $T_3$ , Four synchronous motors  $M_1$  to  $M_4$  connected to bus-4 through Transformer  $T_4$ , Transmission lines  $TL_1$ ,  $TL_2$ ,  $TL_3$  and  $TL_4$  connected between bus 1-2, 2-3, 3-4 and 4-1 respectively.
- c. What are the main characteristics of an ideal insulator? Describe the main advantages and disadvantages of glass insulators. Explain rating and string efficiency of an insulator.
- d. Derive expressions for the line-to-neutral capacitance and line-to-line capacitance of a single phase line.
- e. Discuss the inter-sheath grading of cables. What are practical difficulties in the grading of cables.

**SECTION C****3. Attempt any one part of the following: 10 x 1 = 10**

- (a) A generating station has a maximum demand of 35 MW, a load factor of 50 %, a plant capacity factor of 80 % and a plant use factor of 62 %. Find (i) the reserve capacity of the plant (ii) the daily energy produced and (iii) Maximum energy that could be produced daily if the plant while running as per schedule, were fully loaded.



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- (b) Define and explain the importance of the following terms in generation: (i) connected Load (ii) Maximum Demand (iii) Diversity Factor (iv) Average Load.

**4. Attempt any *one* part of the following: 10 x 1 = 10**

- (a) Explain difference between skin effect and proximity effect.  
What is the percentage saving in copper feeder if the line voltage in a 2-wire d.c. system is raised from 220 V to 450 V for the same power transmitted over the same distance and having the same power loss?
- (b) Derive the A, B, C, D constants for the transmission line represented by nominal T section and Draw its phasor diagram.

**5. Attempt any *one* part of the following: 10 x 1 = 10**

- (a) What do you understand by vibration dampers in overhead transmission line? Describe the different types of dampers used.
- (b) An overhead line at a river crossing is supported from two towers of heights 30 meters and 90 meters above water level with a span of 300 meters. The weight of the conductor is 1 kg/meter and the working tension is 2000 kg. Determine the clearance between the conductor and the water level midway between the towers.

**6. Attempt any *one* part of the following: 10 x 1 = 10**

- (a) Starting from first principles, derive the expression for inductance of a 3-phase unsymmetrical spaced transposed transmission line.
- (b) The three conductors of a 3-phase line are arranged at the corners of a triangle of sides 2m, 2.5m and 4.5m. Calculate the inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1.24 cm.

**7. Attempt any *one* part of the following: 10 x 1 = 10**

- (a) Show that the most economical size of conductor in a single core cable is obtained when radius of cable sheath (R) equals e.r. where e is the base of radius of conductor. Explain dielectric loss.
- (b) Find the most economical diameter of a single core cable to be used on 66 KV, 3 phase system. If the peak permissible stress is not to exceed 50 KV/m. Also find overall diameter.