

Subject Code: XXXXX

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BTECH
(SEM-3) POWER SYSTEM - I 2021-22

TIME:3 HOUR

Total Marks: 100

Instruction: Attempt the questions as per the given instructions. Assume missing data suitably.

SECTION - A

Attempt *All Parts* in Brief

2*10 = 20

Q1	Questions	Marks
(a)	What is demand factor ? Why is it important ?	2
(b)	For the same maximum demand, if load factor is decreased, then what will be the cost of energy?	2
(c)	What are the limitations of Kelvin law ?	2
(d)	What is Ferranti effect?	2
(e)	How are voltage distribution and the string efficiency affected by rain?	2
(f)	What is the importance of sag in transmission line?	2
(g)	Differentiate between GMD and GMR.	2
(h)	Why the effect of ground on the line capacitance can be neglected?	2
(i)	Why single core cables are usually not provided with armouring ?	2
(j)	How do voids in the insulation cause breakdown of the cable?	2

SECTION - B

Attempt Any Three of the following

3*10 = 30

Q2	Questions	Marks
(a)	What are the conventional and non conventional sources of energy ? Explain with examples.	10
(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.	10
(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.	10
(d)	Derive expressions for the line-to-neutral capacitance and line-to-line capacitance of a single phase line.	10
(e)	Discuss the inter-sheath grading of cables. What are practical difficulties in the grading of cable ?	10

SECTION - C

Attempt Any One of the following

5*10 = 50

Q3	Questions	Marks
(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.	10
(b)	Define and explain the importance of the following terms in generation: (i) Connected load (ii) Maximum demand (iii) Diversity factor (iv) Average load.	10
Q4	Questions	Marks
(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 DC system is raised from 220 V to 450 V for the same power transmitted over the same distance and having the same power loss ?	10
(b)	Derive the A, B, C, D constants for the transmission line represented by nominal T section and draw its phasor diagram.	10
Q5	Questions	Marks
(a)	What do you understand by vibration dampers in overhead transmission line ? Describe the different types of dampers used.	10
(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	10

	2000 kg. Determine the clearance between the conductor and the water level midway between the towers.	
Q6	Questions	Marks
(a)	Starting from first principles, derive the expression for inductance of a 3-phase unsymmetrical spaced transposed transmission line.	10
(b)	The three conductors of a 3-phase line are arranged at the corners 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.	10
Q7	Questions	Marks
(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.	10
(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.	10