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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R, S) /S5 (WP) (R) /S3 (PT) (S,FE) Examination November 2024 (2019 Scheme)

Course Code: EET 301

Course Name: POWER SYSTEMS I

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1	Define i) Load factor ii) Diversity factor iii) Load Curve	3
2	Draw the block diagram of wind energy conversion system and label the parts.	3
3	The three conductors of a three phase lines 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 1.24cm	3
4	What is transposition of lines? What are its advantages?	3
5	Brief about the necessity of EHVAC transmission.	3
6	Explain the methods to improve string efficiency.	3
7	Define the terms i) RRRV ii) Making capacity iii) PSM	3
8	Explain the architecture of an IEC61850 with schematic.	3
9	Write short note on Arial Bunched Cables.	3
10	Explain various power factor improvement methods.	3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	Explain with a neat block diagram working of thermal power plant.	8
	b)	A power station is to supply four regions of loads whose peak values are 10,000kW, 5000 kW, 8000 kW and 7000 kW. The diversity factor of the load at the station is 1.5 and the average annual load factor is 60%. Calculate the maximum demand on the station and annual energy supplied from the station.	6
12	a)	Explain the design of rooftop /ground mounted solar farm with necessary steps.	7

b) A proposed station has the following load cycle: 7

Time in hours:	6-8	8-11	11-16	16-19	19-22	22-24	24-6
Load in MW:	20	40	50	35	70	40	20

Draw the load curve and find i) Units generated per day ii) Average load iii) Load factor.

Module -2

13 a) Derive the expression for sending end voltage and sending end current in terms of receiving end voltage and receiving end current for long transmission line. 7

b) A three phase, 66 kV, 50 Hz line has a resistance of 9.6Ω, inductance of 0.097mH and capacitance of 0.765 μF per phase respectively. It delivers 24 MVA at 66 kV at 0.8 power factor lagging. Find the sending end current, voltage regulation and transmission efficiency. Use nominal T method. 7

14 a) Derive an expression for capacitance of a three-phase transmission line with symmetrical spacing. 6

b) Derive the ABCD constants of medium lines using nominal π methods. Draw its phasor diagram 4

c) What do you mean by self and mutual GMD? 4

Module -3

15 a) Each line of three phase system is suspended by a string of 3 insulators. Voltage across the line unit is 17.5 kV. Calculate line to neutral voltage. Assume that shunt capacitance between each insulator and earth is 1/8th of capacitance of the insulator itself. Also find the string efficiency 6

b) With the aid of single line diagrams, differentiate between mono polar and bipolar types of HVDC links. Comment on their use in the system 4

c) Brief about surge impedance loading. 4

16 a) Derive the equation for sag in transmission line when supports are at equal and unequal heights 8

b) What are FACTS devices? Explain any one type of FACTS device. 6

Module -4

17 a) With the help of a neat diagram, explain the construction and working of a vacuum circuit breaker 7

	b)	Explain the term duality in terms of amplitude and phase comparators of static relay.	7
18	a)	Explain the operation of a microprocessor based over-current relay with the aid of a block diagram	7
	b)	Explain the principle of fibre optic communication in transmission system	7

Module -5

19	a)	Derive an expression for the most economical value of power factor which may be attained by a consumer.	7
	b)	A 2 wire Dc ring distributor is 300m long and id fed at 240 V at point A. At point B 150m from A, a load of 120A is taken and at C 100m in the opposite direction from A, a load of 80A is taken. If the resistance per 100m of single conductor is 0.03Ω find i) current in each section of distributor ii) Voltage at points B and C.	7
20	a)	A 800 metres 2-wire d.c. distributor AB fed from both ends is uniformly loaded at the rate of 1·25 A/metre run. Calculate the voltage at the feeding points A and B if the minimum potential of 220 V occurs at point C at a distance of 450 metres from the end A. Resistance of each conductor is 0·05 Ω/km.	6
	b)	Calculate the voltage drop and power loss for a radial load of 120A, 0.8 pf lag supplied by a 6.6kV three phase system with branch impedance of 2 +j2ohms.	4
	c)	Write short notes on distribution automation system.	4

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