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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R, S) / S3 (PT) (R, S) Examination December 2023 (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	A generating station has a connected load of 40 MW and a maximum demand of 20 MW: the units generated being 60×10^6. Calculate (*i*) the demand factor (*ii*) the load factor.	3
2	List the advantages of hydro power station.	3
3	What is transposition of lines? Comment on its necessity.	3
4	A single-phase line has two parallel conductors 2 metres apart. The diameter of each conductor is 1·2 cm. Calculate the loop inductance per km of the line.	3
5	What do you mean by shunt compensation of transmission line?	3
6	List different methods of improving string efficiency.	3
7	Draw the block diagram of static relay.	3
8	Explain the significance of insulation coordination in power system.	3
9	Write a short note on distribution automation system.	3
10	What is a ring main distribution system and what are its advantages?	3

PART B

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

Module -1

11	a)	Explain with neat sketch the various parts of a Nuclear Power Plant.	10
	b)	A power station is to supply four regions of loads whose peak values are 10,000 kW, 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.	4

12	a)	With the help of neat block diagram, explain the concept of Smart Grid.	8
	b)	Mention the merits and demerits of solar power generation.	6

Module -2

13	a)	Derive the expression for inductance of a three-phase transmission line with Symmetrical spacing	7
	b)	A 3-phase, 50Hz, 150 km line has a resistance, inductive reactance and capacitive shunt admittance of 0·1 Ω, 0·5 Ω and 3×10^{-6} S per km per phase. If the line delivers 50 MW at 110 kV and 0·8 p.f. lagging, determine the sending end voltage and current. Assume a nominal π model of the line.	7
14	a)	A 3-phase, 50 Hz, 132 kV overhead line has conductors placed in a horizontal plane 4 m apart. Conductor diameter is 2 cm. If the line length is 100 km, calculate the charging current per phase assuming complete transposition.	4
	b)	With the help of neat circuit diagram and phasor diagram, analyse a medium transmission line using Nominal T method	10

Module -3

15	a)	Derive the expression for Sag, when supports are at unequal levels.	8
	b)	What do you mean by FACTS? What are the devices used as FACTS devices? List the advantages of FACTS devices in power system.	6
16	a)	What is Corona? What are the factors affecting Corona? What are the different methods to reduce Corona effect?	8
	b)	What are the advantages of HVDC transmission over HVAC transmission.	6

Module -4

17	a)	With a neat sketch explain the principle of operation of a Vacuum Circuit Breaker	8
	b)	With the help of block diagram, Explain the principle of operation of a microprocessor-based relay.	6
18	a)	Draw a neat sketch of any one of electromechanical relay and explain its construction and operation.	8
	b)	What are the primary causes of over voltages? How are the equipment protected from over voltages?	6

Module -5

19	a)	With the help of neat sketches, explain, how to improve power factor using capacitors.	8

b) Write short notes on the following 6

i) Regulated energy market

ii) De regulated energy market

20 a) i) Draw and explain single line diagram showing a typical AC distribution system. 8

ii) Define and explain the terms: feeder and distributor

b) i) What is Electricity Tariff 6

ii) What are the factors affecting Tariff?

iii) List different types of Electricity Tariff.

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