Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S,FE) (FT/WP/S3PT) Examinations June 2026 (2019 Scheme)

Course Code: EET301
Course Name: POWER SYSTEMS I

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks)

		Marks
1	With the help of a neat block diagram, explain solar power generation.	(3)
2	Define load factor and diversity factor.	(3)
3	A three-phase transmission line has a horizontal configuration with a spacing of 6 m between adjacent conductors and 12 m between outer conductors. The radius of each conductor is 1.81 cm. Find the inductance per phase per km of the line.	(3)
4	Explain the transposition of a 3-phase transmission line.	(3)
5	What are the advantages of HVDC transmission over HVAC transmission?	(3)
6	What are the advantages of FACTS devices?	(3)
7	Explain the ratings of a circuit breaker?	(3)
8	What are the basic requirements of a protective relay?	(3)
9	Explain aerial bunched cables.	(3)
10	Explain the importance of choosing a transformer location.	(3)

PART B

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

Module -1

11	a)	With a neat schematic diagram, explain the working of a nuclear power plant.	(8)
	b)	A 100 MW power station delivers 100 MW for 2 hours, 50 MW for 6 hours, and is shut down for the rest of each day. It is also shut down for maintenance for 45 days each year. Calculate its annual load factor.	(6)
12	a)	With a schematic diagram, explain the working of a hydroelectric power plant.	(8)
	b)	The 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 the annual energy supplied from the station.	(6)

Module -2

13 a) Derive the expression for the capacitance of a three-phase overhead transmission line, assuming symmetrical spacing between conductors (7)

b) Derive the inductance of a single-phase transmission line with three conductors arranged vertically in Side A and two conductors in Side B. The distance between adjacent conductors in each Side is 6 m and that between the sides are 8 m. Each conductor is of radius 0.3 cm. (7)

14 a) Derive the ABCD parameters of medium transmission lines using nominal π methods. Draw its phasor diagram (7)

b) Derive the ABCD parameters of long transmission lines using Rigorous method. (7)

Module -3

15 a) Derive the expression for Sag when supports are at equal and unequal levels. (7)

b) Each line of the 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 the capacitance of the insulator itself. Also, find the string efficiency. (7)

16 a) What is Corona? What are the factors affecting Corona? What are the different methods to reduce the Corona effect? (7)

b) An overhead transmission line conductor having a parabolic configuration weighs 1·925 kg per metre of length. The area of X-section of the conductor is 2·2 cm^2 and the ultimate strength is 8000 kg/cm^2. The supports are 600 m apart having 15 m difference of levels. Calculate the sag from the taller of the two supports which must be allowed so that the factor of safety shall be 5. Assume that ice load is 1 kg per metre run and there is no wind pressure. (7)

Module -4

17 a) With diagram explain the construction and working of an SF6 circuit breaker. (7)

b) With block diagram explain the working of static relay. (7)

18 a) With the help of a block diagram explain the working of the microprocessor-based over current relay. (7)

b) With circuit diagram explain the working of attracted armature type electro-mechanical relay. (7)

Module -5

19 a) What are the causes of low power factor? Explain power factor improvement by static capacitors. (7)

b) A single-phase distributor 2 kilometres long supplies a load of 120A at 0.8 pf lagging at its far end and a load of 80A at 0.9 pf lagging at its mid-point. Both power factors are referred to the voltage at the far end. The resistance and reactance per kilometre are 0.5Ω and 0.1Ω respectively. If the voltage at the far end is maintained at 230V, calculate (i) voltage at sending end, (ii) phase angle between voltages at the two ends. (7)

20 a) Explain different parts of distribution system (5)

b) A 2-wire DC ring distributor is 300 m long and is fed at 240 V at point A. At point B, 150 m from A, a load of 120 A is taken, and at C, 100 m in the opposite direction, a load of 80 A is taken. If the resistance per 100 m of single conductor is 0·03 Ω, find: (i) current in each section of distributor, (ii) voltage at points B and C (9)

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