

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S5 (S,FE) / S3 PT Examination May 2025 (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	What factors are considered while selecting the site for thermal power station?	3
2	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.	3
3	A single-phase transmission line has two parallel conductors 1.5 metres apart, the diameter of each conductor being 0.5 cm. Calculate line to neutral capacitance for a line 80 km long.	3
4	Explain generalised circuit constants of a transmission line.	3
5	An overhead line has a span of 260 m, the weight of the line conductor is 0.68 kg per metre run. Calculate the maximum sag in the line. The maximum allowable tension in the line is 1550 kg,	3
6	What do you mean by critical disruptive voltage?	3
7	Classify different types of UG cables.	3
8	Explain significant features of a numerical relay.	3
9	Explain the term insulation co ordination	3
10	Write a brief note on the various types of electricity tariff	3

PART B

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

Module -1

- 11 a) A power station must meet the following load demand:
- | | | | |
|----------|-------|----------------------------|---|
| Load A - | 50 kW | between 10 A.M. and 6 P.M. | |
| Load B - | 30 kW | between 6 P.M. and 10 P.M. | |
| Load C - | 20 kW | between 4 P.M. and 10 A.M. | 8 |
- Plot the daily load curve and determine (i) diversity factor (ii) units generated per day (iii) load factor

- b) With the help of a block diagram, explain the working of a solar power plant. 6
- 12 a) With the help of neat sketches, explain the construction and working of a hydroelectric power plant. 10
- b) A diesel station supplies the following loads to various consumers:
Industrial consumer = 1500 kW; Commercial establishment = 750 kW
Domestic power = 100 kW; Domestic light = 450 kW 4
If the maximum demand on the station is 2500 kW and the number of kWh generated per year is 45×10^5 , determine (i) the diversity factor and (ii) annual load factor.

Module -2

- 13 a) Derive the expression for capacitance of a three-phase transmission line with Symmetrical spacing 7
- b) Calculate A, B, C and D constants of a 3-phase, 50 Hz transmission line 160 km long having the following distributed parameters:
 $R = 0.15 \Omega/\text{km}$; $L = 1.20 \times 10^{-3} \text{ H/km}$; $C = 8 \times 10^{-9} \text{ F/km}$; $G = 0$ 7
- 14 a) Derive the expression for generalised circuit constants of medium transmission line using Nominal π method 8
- b) A single-phase transmission line has two parallel conductors 3 m apart, the radius of each conductor being 1 cm. Calculate the loop inductance per km length of the line if the material of the conductor is (i) copper (ii) steel with relative permeability of 100 6

Module -3

- 15 a) Define string efficiency. With the help of neat sketches, derive mathematical expression for string efficiency. 10
- b) A single core cable 5 km long has an insulation resistance of 0.4 M Ω . The core diameter is 20 mm and the diameter of the cable over the insulation is 50 mm. Calculate the resistivity of the insulating material. 4
- 16 a) What do you mean by sag? With the help of a neat sketch, derive the expression for Sag 'when supports are at equal levels'. 10
- b) A 3-phase line has conductors 2 cm in diameter spaced equilaterally 1 m apart. If the dielectric strength of air is 30 kV (max) per cm, find the disruptive critical voltage for the line. Take air density factor $\delta = 0.952$ and irregularity factor $m_0 = 0.9$. 4

Module -4

- 17 a) With the help of a neat diagram explain the working of a surge diverter. 7
b) Draw and explain the block diagram of static relay 7
- 18 a) Explain the phenomenon of arc formation. What are different arc interruption methods used? 6
b) With the help of a neat diagrams, explain principle of operation of 8
i) Distance protection
ii) Differential Protection

Module -5

- 19 a) Explain the following systems of distribution: 9
(i) Radial system
(ii) Ring main system
(iii) Interconnected system
b) i) What is the significance of Electricity Tariff? 5
ii) Write a brief note on the various types of Electricity Tariff.
- 20 a) Write short notes on the following: 6
(i) Distribution transformers
(ii) Primary distribution
(iii) Secondary distribution
b) i) What are the objectives for establishing an electricity market? 8
ii) Explain the various electricity market models adopted in India.
