

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R,S) (FT/WP/S3 PT) Examination November 2025 (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 | Explain skin effect and Ferranti effect. | 3 |
| 2 | Enlighten upon various components and their operation of a hydroelectric powerplant. | 3 |
| 3 | Explain the concept of micro grid and smart grid in power system operation. | 3 |
| 4 | Derive the ABCD parameter of medium transmission line using nominal T method | 3 |
| 5 | What is meant by grading of insulators? What is its significant? | 3 |
| 6 | Explain methods to reduce the corona in transmission lines | 3 |
| 7 | Derive an expression for rate of rise of restriking voltage in circuit breakers. | 3 |
| 8 | List the causes of over voltages in a power system. | 3 |
| 9 | Write short note on energy market. | 3 |
| 10 | Write short notes on the following:
i) Two part tariff ii) Power factor tariff | 3 |

PART B*(Answer one full question from each module, each question carries 14 marks)***Module -1**

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|----|---|---|
| 11 | a) With a neat schematic diagram explain the construction and working of a nuclear power plant. | 8 |
| | b) With the help of a block diagram, explain the working of wind energy conversion | 6 |
| 12 | a) What is Deaerator? Explain its operation with block diagram. | 7 |
| | b) A hydro-electric generating station is supplied from a reservoir of capacity 5×10^6 cubic meters at a head of 200 meter's. Find the total energy available in kWh if overall efficiency is 75%. | 7 |

Module -2

- 13 a) Derive the expression for capacitance in a single-phase overhead line under the influence of earth effect. 7
- b) An 80 km long transmission line has a series impedance of $(0.15+j0.75)$ ohm per km and a shunt admittance of $j5.1 \times 10^{-6}$ ohm per km. Find the A, B, C, D parameters by Nominal π method 7
- 14 a) Using rigorous method, derive the expression for sending end voltage and current for a long transmission line. 7
- b) Derive the expression for inductance of a three-phase overhead transmission line with unsymmetrical spacing. 7

Module -3

- 15 a) A transmission line conductor at a river crossing is supported from two towers at a height of 45m and 75m above the water level. The span length is 300m. Weight of the conductor is 0.85kg/m. Determine the clearance between the conductor and water at a point midway between towers if the tension in the conductor is 2050kg. 7
- b) What do you mean by sag? Derive the expression for sag when the supports are at same level. 7
- 16 a) With a neat sketch explain various parts of an underground cable. 5
- b) Explain the different types of DC links with neat figures. 5
- c) What is string efficiency? What are the methods to improve string efficiency? 4

Module -4

- 17 a) A 50Hz, 11kV, 3phase has a reactance of 5 ohm per phase and is connected to a bus through a circuit breaker. The distributed capacitance up to circuit breaker between phase and neutral is $0.01\mu\text{F}$. Determine 8
- i) Peak restriking voltage across the contacts of the circuit breaker
- ii) Frequency of oscillations
- iii) The average rate of rise of restriking voltage upto first peak
- b) With the help of a neat diagram explain the working of any one surge diverter 6
- 18 a) Explain the operation of a microprocessor based over-current relay with the aid of a block diagram and flow chart. 8
- b) What are the basic requirements of a protective relaying 6

Module -5

- 19 a) A single-phase distributor 2 kilometres long supplies a load of 120 A at 0.8 p.f. 7

lagging at its far end and a load of 80 A at 0.9 p.f. lagging at its mid-point. Both power factors are referred to the voltage at the far end. The resistance and reactance per km are 0.05Ω and 0.1Ω respectively. If the voltage at the far end is maintained at 230 V, calculate: (i) voltage at the sending end (ii) phase angle between voltages at the two ends

b) A single phase a.c. generator supplies the following loads : 7

(i) Lighting load of 20 kW at unity power factor.

(ii) Induction motor load of 100 kW at p.f. 0.707 lagging.

(iii) Synchronous motor load of 50 kW at p.f. 0.9 leading.

Calculate the total kW and kVA delivered by the generator and the power factor at which it works.

20 a) Derive the equations for voltage drop and current loss in a two-wire ring main distributor supplied by (i) DC and (ii) AC Voltages 4

b) Derive an expression for the most economical value of power factor which may be attained by a consumer. 6

c) What is effect of power factor on the cost of generation? 4
