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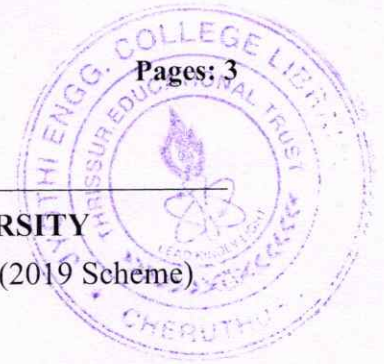
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Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S, FE) / S3 (PT) (S) Examination June 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 diversity factor and explain its significance. | 3 |
| 2 | What factors are to be taken into account while selecting the site for a nuclear power station? | 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 | Derive an expression for the inductance of an isolated current carrying conductor | 3 |
| 5 | A single core cable has a conductor radius of 14.5 mm and an insulation thickness of 4.6 mm. Find the capacitance per metre length of the cable if the dielectric has a relative permittivity of 3.2. | 3 |
| 6 | What are the factors effecting sag in an over head line | 3 |
| 7 | With the help of a block diagram, explain the working of a static relay. | 3 |
| 8 | Write notes on insulation co-ordination. | 3 |
| 9 | Explain the different types of DC distributors. | 3 |
| 10 | Explain what do you mean by distribution automation systems. | 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 steam power plant. | 10 |
| | b) The annual load duration curve of a small hydro plant shows 438×10^4 KWh of energy during the year. It is a peak load plant with 20% annual load factor. Find the station capacity if plant capacity factor is 15%. Find the reserve capacity of the plant. | 4 |

- 12 a) Explain the importance of control rod and moderator in a nuclear power station with the help of block diagram 5
- b) Write short notes on smart grid and micro grid 5
- c) List the advantages and disadvantages of grid connected solar electric system 4

Module -2

- 13 Derive the A,B,C,D constants for a medium transmission line using nominal T method. Draw the vector diagram also. 14
- 14 a) A three phase transmission line having a series impedance of $20 + j30$ Ohms delivers 7 MW at 33 kV and 0.85 lagging power factor. Find the sending end voltage, regulation and power angle. Neglect capacitance. 5
- b) Derive an expression for the capacitance of a single phase overhead line 5
- c) A three phase, 50Hz, 132KV overhead line has conductors placed in a horizontal plane 4m apart. Conductor diameter is 2cm. If the line length is 100km, calculate the charging current per phase. Assume complete transposition. 4

Module -3

- 15 a) Explain what do you mean by shunt compensation. Compare its advantages with series compensation. 5
- b) A 3-phase, 220 kV, 50 Hz transmission line consists of 1.5 cm radius conductor spaced 2 metres apart in equilateral triangular formation. If the temperature is 40°C and atmospheric pressure is 76 cm, calculate the corona loss per km of the line. Take $m_0 = 0.85$ 5
- c) What are the advantages and disadvantages of HVDC transmission system 4
- 16 a) Explain different types of insulators used in overhead transmission lines 5
- b) With the aid of single line diagrams, explain the different types of HVDC links. Comment on their use in the system. 5
- c) What is string efficiency of insulators? List different methods to improve string efficiency. 4

Module -4

- 17 a) Explain the operation of a Vacuum CB using a neat sketch and write its advantages 7
- b) Define Rate of Rise of Restriking Voltage and derive the expression 7
- 18 a) With the help of a neat diagram explain the working of a surge diverter. 5
- b) Explain how an amplitude comparator can be converted to a phase comparator and vice versa 5

- c) What are the advantages and disadvantages of a numeric relay 4

Module -5

- 19 a) What are the causes of low power factor? Explain power factor improvement by static capacitors. List three advantages and disadvantages. 9
- b) A factory has a maximum load of 240 kW at 0.8 p.f. lagging with an annual consumption of 50,000 units. The tariff is Rs 50 per kVA of maximum demand plus 10 paise per unit. Calculate the flat rate of energy consumption. What will be annual saving if p.f. is raised to unity? 5
- 20 a) A factory operates at 0.8 p.f. lagging and has a monthly demand of 750 kVA. The monthly power rate is Rs 8.50 per kVA. To improve the power factor, 250 kVA capacitors are installed in which there is negligible power loss. The installed cost of equipment is Rs 20,000 and fixed charges are estimated at 10% per year. Calculate the annual saving effected by the use of capacitors 5
- b) Write notes on different types of tariff. 5
- c) Write short notes on aerial bunched cables. Compare its advantages and disadvantages. 4