Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2023
ELECTRICAL AND ELECTRONICS ENGINEERING
(2020 SCHEME)

Course Code : 20EET301

Course Name: Power Systems – I

Max. Marks : 100 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Describe the structure of a microgrid.
2. List the limiting factors in tapping the wind and solar potential.
3. Distinguish between the T and π model of medium transmission lines.
4. What is transposition of lines? Comment on its necessity in the system.
5. Explain the different methods of grading of underground cables.
6. Differentiate between disruptive critical voltage and visual critical voltage.
7. A circuit breaker is rated as1500A,1000MVA, 33KV, 3 sec, 3 phase oil circuit breaker. Find (i) rated symmetrical breaking current (ii) rated making current (iii)short time rating.
8. Explain the problems associated with capacitive current chopping.
9. Discuss the various methods of power factor improvement.
10. List the advantages and disadvantages of HVDC transmission systems.

PART B

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

MODULE I

11. a) Explain hydro electric power plant using a neat sketch. (8)
    b) A generating station is to supply four regions of load whose peak loads are10MW, 5MW, 8MW and 7 MW. The diversity factor at the station is 1.5 and the average annual factor is 60%. Calculate (i)the maximum demand on the station. (ii) annual energy supplied by the station. (6)

OR

12. a) Explain the terms load factor and diversity factor. How do these factors influence the cost of generation? (7)
    b) With a neat sketch, explain the principle of working of a nuclear power plant. (7)

MODULE II

13. a) A 200 km,3phase overhead transmission line has its conductor arranged at the corners of an equilateral triangle of 2.5m side. Calculate the capacitance of each line conductor per km. The radius of each conductor is 1cm.calculate (7)
(i) line to neutral capacitance of the line.
(ii)charging current per phase if the line is maintained at 66KV, 50Hz.

b) Derive the equation for the loop inductance of a single-phase overhead line. (7)

OR

14. a) A balanced 3 phase load of 30MW is supplied at 132KV,50Hz and 0.85pf lagging by means of a transmission line. The series impedance of a single conductor is 20+j52 ohms and the total phase –neutral admittance is $315x10^{-6}$ Siemen. Using nominal T method, determine (i) the A, B, C and D constants of the line (ii) sending voltage. (8)

b) Derive the capacitance of a single phase two wire line considering the effect of earth. (6)

MODULE III

15. a) (i) Explain Corona and factors affecting it. (7)
(ii) Discuss the methods to reduce Corona.

b) Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5 kV, calculate line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is 1/8th of the capacitance of the insulator itself. Also find the string efficiency. (7)

OR

16. a) Calculate the capacitance and charging current of a single core cable used on a 3 phase,66KV system. The cable is 1km long having a core diameter of 10cm and an impregnated paper insulation of thickness 7cm.The relative permittivity of the insulation may be taken as 4 and the supply at 50Hz. (8)

b) Comment on the effect of wind and ice loading on transmission line with respect to change in sag calculation. (6)

MODULE IV

17. a) Explain the operation of a microprocessor based over-current relay with the aid of a block diagram. (8)

b) Discuss the causes of over voltages. Explain the working of a surge diverter. (6)

OR

18. a) With a neat sketch explain the principle of operation of an air blast circuit breaker. (7)

b) A 50Hz,11KV,3 phase alternator with earthed neutral has a reactance of 5 ohms per phase and is connected to a busbar through a circuit breaker. The distributed capacitance upto circuit breaker between phase and neutral is 0.01μF. Determine (7)
(i) peak restriking voltage across the contacts of the breaker
(ii)frequency of oscillation.
(iii)the average rate of rise of restriking voltage.

MODULE V

19. a) A two wire DC ring distributor is 30m long and is fed at 240V at point A. At point B,150m from A, a load of 120A is taken and at C,100m in the opposite direction, a load of 80A is taken. If the resistance per 100m of single conductor is 0.03Ω. Find, (8)
(i)current in each section of distributor.
(ii)voltage at points B and C.

b) Explain different connection schemes of distribution systems. (6)

OR

20. a) Classify the FACTS devices with suitable example. (6)

b) A 3 phase,50 Hz,400V motor develops 100HP, the power factor being 0.75 lagging and efficiency 93%. A bank of capacitors connected in delta across the supply terminals and power factor raised to 0.95 lagging. Each of the capacitance units is built of 4 similar 100V capacitors, Determine the capacitance of each capacitor. (8)

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