**Code No: 124AD** **R15**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B.Tech II Year II Semester Examinations, December - 2017**
**POWER SYSTEMS – I**
**(Electrical and Electronics Engineering)**

**Time: 3 Hours** **Max. Marks: 75**

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A** **(25 Marks)**

1.a) What is the need of Control rods in nuclear plants? [2]
b) What is the function of economizer? [3]
c) What are the design features of distribution systems? [2]
d) How the distribution systems are classified? [3]
e) What are the merits and demerits of main and transfer bus bar system? [2]
f) What are the advantages and disadvantages of Air insulated substations? [3]
g) What are the methods used for improving power factor? [2]
h) What are the merits of on load tap changing transformer? [3]
i) Define the integrated load duration curves. [2]
j) What are the desirable characteristics of tariff? [3]

**PART – B** **(50 Marks)**

2. Write different components which are used for increasing the efficiency of a thermal power station. Explain them in detail. [10]

**OR**

3.a) Draw a neat line diagram of a nuclear power plant showing basic components. Discuss the merits of nuclear power plant compare to thermal power plants.
b) Explain with a neat diagram, the various parts of a nuclear reactor, mentioning clearly the function of each part. [5+5]

4.a) Compare underground and over head distribution systems.
b) If the resistance of a distributor (both return and ground) is 0.05 ohm/m and the distributed load in section 'DE' is 1 A/m, find the current distribution and minimum voltage in the distributor as shown in below figure 1, when
i) Both the ends are at same potential and
ii) Potential difference between the ends 'A' and 'B' is 4 Volts. [5+5]

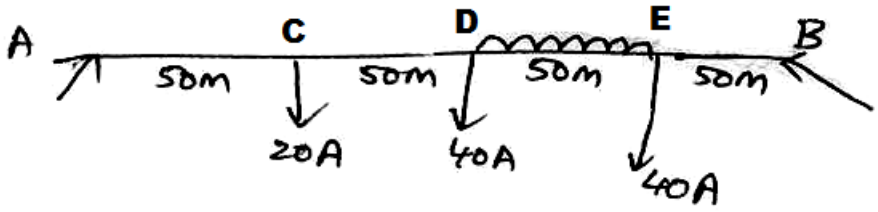


**Figure 1**

**OR**

5. A 3-phase distribution system is shown in below figure 2. Power is supplied at 'A' at a line voltage of 11kV and balance loads of 25A per phase at 0.8 p.f lag and 35A per phase at 0.9 p.f lag are taken at B and C. The impedance of the feeders are $Z_{AB} = (5+j9)\Omega$, $Z_{BC} = (6+j10)\Omega$ and $Z_{CA} = (4+j8)\Omega$. Calculate the voltages at B, C and D and the current in each branch. Load at mid point D of section BC is 10A at upf. Power factors are assumed with respect to voltage at 'A'. [10]

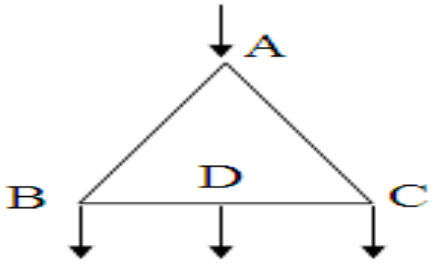


**Figure 2**

6.a) Make a list of the main equipment in a substation. Draw layout of a typical substation.

b) Explain the constructional aspects of gas insulated substations. [5+5]

**OR**

7.a) What is the difference between indoor and outdoor substations? What are the factors which are to be considered for a selection of a site of a substation?

b) Draw the single line diagram of a GIS. [5+5]

8.a) What are the sources for generation and absorption of reactive power in a given power system?

b) A synchronous motor having a power consumption of 40kW is connected in parallel with a load of 250 kW having a lagging p.f. of 0.85. If the combined load has a p.f of 0.95, what is the value of leading reactive kVA supplied by the motor and at what p.f is it working? [5+5]

**OR**

9.a) What are the various methods of voltage control? Explain the booster transformer for voltage control.

b) A single-phase motor connected to a 230 V, 50 Hz supply takes 25 A at a p.f of 0.8 lag. A capacitor is shunted across the motor terminals to improve the p.f to 0.95 lag. Determine the capacitance of the capacitor to be shunted across the motor terminals. [5+5]

10.a) Define and explain the following:
(i) Connected load (ii) Demand factor (iii) Diversity factor (iv) Plant use factor

b) A certain power station annual load duration curve is a straight line from 20 MW to 7MW. To meet this load, three turbine-generator units, two rated at 12 MW each and one rated at 8 MW are installed. Calculate the following
i) Installed capacity ii) Plant factor
iii) Units generated per annum iv) Utilization factor [5+5]

**OR**

11.a) What are the costs of electrical energy? Explain.

b) The data of a power station as follows:
Installed capacity =250 MW
Capital cost = Rs. $300 \times 10^6$
Rate of interest and depreciation = 15%
Annual cost of fuel oil, salaries and taxation = Rs. $40 \times 10^6$
Load factor = 0.7
Determine the cost of generation and cost of saving per kWh if the annual load factor is raised to 0.85. [5+5]

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