**B.E. ELECTRICAL ENGINEERING SECOND YEAR SECOND SEMESTER - 2019**
**Power Supply Systems**
Time: Three hours                    (50 marks for each part)                    Full Marks: 100
Use separate answer script for each part.
PART I
Answer **any FIVE** questions.
Figures in the margin indicate full marks

1.  a) Discuss step by step how coal is sent to the furnace from mine in a steam power plant?          (5+2+3)
    b) 'In balanced draught system induced draught is provided somewhat more than forced draught'- Justify or correct the statement with proper explanation.
    c) 'Air-fuel ratio is higher in stoker firing than pulverized fuel firing.' - Justify or correct the statement with proper explanation.

2.  Write short notes on (i) boiler (ii) condenser in a steam power plant          (5x2)

3.  a) Discuss the characteristics of a base load plant.          (3+7)
    b) A certain region has a maximum demand of 500 MW and an annual requirement of $3x10^6$MWh. The supply utility has to meet the demand by setting up a gas-turbine and a coal fired thermal power plant. The installation and operating costs of the two kinds of plants are as follows:
    Gas-turbine plant: Rs. 80 lakhs, Rs. 1000 per kW and Rs. 2.00 per kWh and
    Coal-fired plant  : Rs. 100 lakhs, Rs. 6000 per kW and Rs. 1.20 per kWh
    Determine the (i) annual generation of each plant and (ii) overall cost per kWh. Derive necessary formula. Assume that the load duration curve decreases linearly with time.

4.  a) Discuss the principle of operation of a pumped storage plant.          (6+4)
    b) A hydroelectric power plant is supplied from reservoir having an area of 50 km2 and a head of 50m. If the overall efficiency of the plant is 60%, find the rate at which the water level of the reservoir will fall when the station is generating 30,000kW.

5.  What is nuclear fission? Explain how electricity is generated in a nuclear power plant.          (10)

6.  a) Differentiate between mass curve and flow duration curve with a suitable example.          (4+6)
    b) Discuss the functions of (i) dam (ii) penstock (iii) spillway of a hydroelectric plant

7.  Draw and explain the schematic diagram of an open cycle gas turbine with the improvements          (10)
    of efficiency.

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**SECOND SEMESTER EXAM 2019**

**POWER SUPPLY SYSTEMS**

**Time:** Three Hours                                      **Full Marks:** 100

( 50 marks for each part)
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**PART-II**

Answer *all the* questions from this part.

1.  a) Determine the volume of conductor material required for two phase three wire ac system with      8
neutral point earthed in overhead transmission lines. State the assumptions.

OR

Determine the volume of conductor material required for two phase three wire ac system with
neutral point earthed in underground cables. State the assumptions.

b) Determine the expression for voltage drop in a uniformly loaded dc distributor fed at both      8
ends with equal voltages. Draw the current loading and voltage drop diagrams.

OR

Derive necessary expression to find the point of minimum potential in a uniformly distributed
dc distributor fed at both ends with unequal voltages.

2.      A dc 2 wire system is to be converted into ac 3 phase 3 wire system by addition of a third      8
conductor of the same size as the two existing conductors. Determine the percentage
additional balanced load which can now be carried by the conductors at 0.8 power factor
lagging with the same voltage between the conductors and the same percentage power loss.

OR

Power is distributed to the consumers either by a three wire dc system or by a three phase
four wire ac system. Compare the amount of conductors required in the two systems. Assume
the same voltage between each conductor and earth, same percentage loss, balanced load and

0.9 power factor. All the wires are of same cross sectional area.

3. State Kelvin's law and its limitations. The daily load cycle of a three phase transmission line, 20 km long, is equivalent to a current of 100 A for 8 hours, 75 A for 7 hours and 20 A for 9 hours. The capital cost per km of the line is Rs.(9500+24000a) where 'a' is the cross section in cm$^2$ of the conductor. The line is in operation for 300 days in a year. Find the most economical cross section of the conductor assuming interest and depreciation of 10% per annum and energy cost to be 5 paise per unit. Resistance per km of the conductor of 1 cm$^2$ cross section is 0.19 ohm.    10
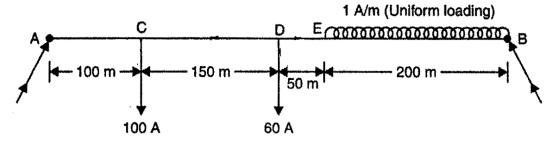
<div align="center">OR</div>

Prove Kelvin's law. A two conductor cable is required to supply a constant load of 200A throughout the year. The cost of the cable is Rs. (50a+25)/ m, where 'a' is the area of the conductor in cm$^2$. The line is in operation for 250 days in a year. Find the most economical cross section of the conductor assuming interest and depreciation of 10% per annum and energy cost to be 5 paise per unit. Specific resistivity of the conductor is 1.85μΩ/ m.

4. Discuss the different services provided by a substation. What are the advantages in high tension service main connection?    8

<div align="center">OR</div>

Describe with suitable diagram the double bus bar system in a substation.

5. A dc distributor shown in the figure below is fed at both ends with 200V. The resistance of the distributor (go and return) is 0.001Ω/m. Determine the point of minimum voltage and the value of the minimum voltage.    8



1 A/m (Uniform loading)