**B.E. ELECTRICAL ENGINEERING SECOND YEAR SECOND SEMESTER EXAM 2023**

**POWER SUPPLY SYSTEM**

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 the necessity of pure water in a steam power plant and also the procedure of    (6+4)

   getting the pure water.

   b) Justify the statement-'Steam power plants are not suitable for supplying fluctuating

   loads.'

2. Discuss the functions of (i) Control rod of nuclear reactor (ii) starting motor of gas

   turbine power plant (iii) surge tank for hydroelectric turbine (iv) DM plant of steam

   power station (v) turning gear of steam power plant

3. With the help of a suitable diagram, discuss the turbine governing system used in    (10)

   hydroelectric plant.

4. A certain region has a maximum demand of 500 MW which decrease linearly with time    (10)
   to 200MW over a year. 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.

5. With a schematic diagram describe the principle of operation of a close cycle gas turbine    (10)
   plant.

6. Draw a neat diagram of boiling water nuclear reactor and describe the function of each    (10)
   component of such reactor.

7. a) Distinguish between peak load plant and base load plant.    (4+6)

   b) The variation of the load over the 24 hours of a day is as given below. Draw the load
   curve and  load-duration curve:

   | Hour      | 0-4 | 4-8 | 8 –12 | 12–16 | 16–20 | 20 – 24 |
   |-----------|-----|-----|-------|-------|-------|---------|
   | Load  (MW)| 40  | 60  | 100   | 80    | 100   | 70      |

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**POWER SUPPLY SYSTEMS**

**Time: Three hours**                                               **Full Marks: 100**

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**PART – II**

**Group A**

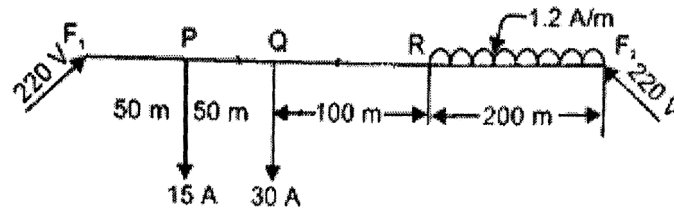**Answer any three of the following questions.**

1. i) Derive an expression for the distance of the point of minimum potential in a uniformly loaded distributor fed at both ends with unequal voltages.                    4

   ii) A dc two wire system is to be converted to ac three phase three wire system by addition of a third conductor of the same size as the two existing conductors. Determine the percentage additional load which the three phase conductors can carry at 0.9 power factor lagging with the same voltage between the conductors and the same percentage power loss.                    6

2. Compare the volume of conductor material required for dc two wire system (one conductor earthed) with ac two phase three wire system in overhead lines. State the assumptions.     7+3

3. Mention the limitations of Kelvin's law. 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. Applying Kelvin's law determine the most economical size for 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.    3+7

4. i) A 2 wire dc distributor ABCDEA in the form of a ring main is fed at point A at 230 V and is loaded as: 20 A at B; 40 A at C; 60 A at D and 20 A at E. The resistance of various sections (go and return) are: AB=0.1Ω, BC=0.05 Ω, CD=0.01 Ω, DE=0.025 Ω and EA=0.075 Ω. Determine the point of minimum potential and current in each section of the distributor.     6

ii) Show that the volume of conductor material reduces with increase in transmission voltage.

4

5. What are the drawbacks of radial distribution system? The resistance of each conductor of the 2 wire dc distributor shown in the figure below is 0.02 ohm/km. Determine the point of minimum potential and the minimum voltage. 2+8



**Group B**

**Answer any two of the following questions**

6. i) Explain the functions of instrument transformers in a substation. 4

ii) Explain the principle of operation of HRC fuse. What are the advantages of a circuit breaker over a fuse? 4+2

7. i) What is the primary objective of earthing electrical equipment? Discuss on plate earthing.
   2+3
   ii) Explain the principle of operation of compact fluorescent lamp. 5

8. i) What are the advantages of high tension service main connections? 3

ii) Mention the general stipulations to be followed for low tension service main connection. 7