Code No: R2022023 **R20** **SET - 1**

II B. Tech II Semester Regular/Supplementary Examinations, July - 2023

POWER SYSTEM-I

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks

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UNIT-I

1 a) Give the layout of a thermal power plant and explain it briefly? [7M]

b) A steam power station spends Rs. 90 lakhs per annum for coal used in the station. The coal has a calorific value of 15000 kcal/kg and costs Rs. 320 per ton. If the station has thermal efficiency of 36% and electrical efficiency of 92%, find the average load on the station. [7M]

Or

2 a) Give the layout of hydroelectric power plant and explain it briefly. [7M]

b) Explain the site selection procedure for the hydro power plant. [7M]

UNIT-II

3 a) Explain the working principle of nuclear chain reaction? [7M]

b) Write short notes on the following [7M]
i)Radiation Hazards
ii)coolants
iii) control rods

Or

4 a) Explain the classification of nuclear reactor and briefly discuss about each one. [7M]

b) Discuss the internal hazards due to radiations. [7M]

UNIT-III

5 a) Discuss the installation and maintenance of gas insulated substations. [7M]

b) Classify various types of substations according to service requirements and explain? [7M]

Or

6 a) Discuss the features, advantages and disadvantages of main and transfer single bus bar arrangement and one and half breaker system arrangement. [7M]

b) Write short notes on the comparison of air insulated substations and gas insulated substations. [7M]
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UNIT-IV

7 a) What is the most general criterion for the classification of cables? Draw the sketch of a single core low tension cable and label the various parts. [7M]

b) A 11 kV, 50 Hz, single-phase cable has a diameter of 12 mm and an internal sheath radius of 19 mm. If the dielectric has a relative permittivity of 24, determine for a 2.8 km length cable: (i) The capacitance. (ii) The charging current [7M]

Or

8 a) Explain in detail about Capacitance grading and also give their merits and demerits. [7M]

b) The capacitance between any two conductors of a three-phase, three conductor cable is 2μF. The cable operates at 11KV line voltage and 50 Hz. What is the charging current through the cable capacitance? [7M]

UNIT-V

9 a) Discuss the different classifications of costs of electrical energy. [7M]

b) The yearly load duration curve of a certain power station can be approximated as a straight line the maximum and minimum loads being 90MW and 50 MW respectively. Three alternator units, two rated at 20 MW each and at 10 MW are installed to meet this load. Calculate [7M]
(i) Installed capacity
(ii) Load factor
(iii) Plant factor
(iv) kWh generated per year

Or

10 a) Explain the Two part tariff in detail. [7M]

b) A base load station having a capacity of 400 MW and a stand by station having a capacity of 50MW shares a common load. Find the annual load factors and capacity factors of two power stations from the following data. [7M]
Annual standby station output = 87.33 x 106 KWH
Annual base load station output = 102 x 106 KWH
Peak load on standby station = 120MW
Hours of use by standby station/year = 3000hrs.

Code No: R2022023 **R20** **SET - 2**

II B. Tech II Semester Regular/Supplementary Examinations, July - 2023

POWER SYSTEM-I

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1 a) Explain with a neat block diagram about impulse and reaction turbines steam flow circuit. [7M]
b) Describe the principle operation of hydro power station. [7M]

Or

2 a) Describe briefly various components in modern hydro power plant with neat flow diagram. [7M]
b) Explain in detail about the Cooling towers and chimneys and their role in Thermal Power Stations. [7M]

UNIT-II

3 a) With the help of neat diagram, describe the working of pressurized water reactor. [7M]
b) Explain the radiation hazards and shielding in nuclear power plants. [7M]

Or

4 a) Explain the working principle of nuclear power plant with neat sketch. [7M]
b) Write short notes on nuclear waste disposal. [7M]

UNIT-III

5 a) What are the different types of bus-bar arrangements used in sub-stations? Illustrate our answer with suitable diagrams. [7M]
b) Explain the general installation requirements of a Gas – Insulated Substation. [7M]

Or

6 a) Explain with a neat layout diagram of a double bus bar with Bypass isolator arrangement. [7M]
b) 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. [7M]

UNIT-IV

7 a) Deduce an expression for insulation resistance of a single core cable in terms of specific resistance of dielectric, its core and sheath diameter. [7M]
b) A 3-core, 3-phase metal sheathed cable has capacitance between all conductors bunched and sheath is 0.9 μF and capacitance between two conductors bunched with sheath and third conductor is 0.7 μF. Determine the capacitance when the sheath is insulated for the following conditions: (i) Between any two conductors
(ii) Calculate the capacitance to neutral and charging current taken by the cable when connected to 33 kV, 3-phase, 50 Hz systems. [7M]

Or
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8 a) Show that for the same dimensions of a cable with an inter sheath can withstand a working voltage of 36% higher than a non-intersheath cable. Assume same homogeneous dielectric and most economical designs for both. [7M]

b) For the cable shown above, it is given that R1 = 9 cm, R3 = 2.2cm, and R2=1.5 cm.Find the maximum electric field for an operating voltage of 12.5 kV (i) with capacitance grading and (ii) without capacitance grading. [7M]

UNIT-V

9 a) Explain two-part tariff and compare it with power factor tariff. [7M]

b) Explain the following with respect to the economic aspects power generation: (i) Load duration curve (ii) Diversity factor (iii) Maximum demand and (iv) Plant Capacity factor. [7M]

Or

10 a) Explain the terms Fixed, Semi - fixed and Running costs with respect to Costs of Generation. [7M]

b) A Domestic lighting installation having fifteen 60 watt lamps is operated as follows: [7M]
i) 5 lamps from 6 p.m till 8 p.m ii) 10 lamps from 8 p.m till 10 p.m
iii) 6 lamps from 10 p.m till 12 p.m iv). Determine the demand factor and the daily load factor.

Code No: R2022023 **R20** **SET - 3**

II B. Tech II Semester Regular/Supplementary Examinations, July - 2023

POWER SYSTEM-I

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1 a) What are the functions of economizer and super heater in a thermal power plant? [7M]

b) Explain with a neat block diagram about Feed-water steam flow circuit. [7M]

Or

2 a) Draw the general layout of the hydro station an explain each with neat sketch? [7M]

b) Calculate the average power in kW that can be generated in a hydro-electric project from the following data: [7M]
Catchment area = 5×109 m2; Mean head, H = 40 m
Annual rainfall, F = 1.35 m; Yield factor, K = 80 %
Overall efficiency = 75%.
If the load factor is 50%, what is the rating of generators installed?

UNIT-II

3 a) Explain in detail about Nuclear fission process. [7M]

b) Explain the working of Fast Breeder Reactor(FBR) with a neat diagram. [7M]

Or

4 a) Explain the functions of the following in a nuclear power plant [7M]
(i)Moderator (ii)Reflector (iii)Coolants

b) Explain the working of PWR with a neat diagram. [7M]

UNIT-III

5 a) Explain the general maintenance requirements of a Gas – Insulated Substation. [7M]

b) Draw and explain the layout of 33/11kV with all equipments. [7M]

Or

6 a) With suitable diagrams explain the main and transfer bus arrangement. [7M]

b) Make a list of the main equipment in a sub-station. Draw layout of a sub- station. [7M]

UNIT-IV

7 a) With neat sketch explain he construction and working of the underground cables. [7M]

b) Derive the equation for calculating the insulation resistance of a grading cable. [7M]

Or
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8 a) Write short notes on stress in insulation and power factor of cable. [7M]

b) The insulation resistance of a single core cable is 495M_/Km. If the core diameter is 2.5cm and resistivity of insulation is 4.5 X 10cm. Find the insulation thickness. [7M]

UNIT-V

9 a) What are the objectives and requirements of tariff? [7M]

b) A generating station has the following daily load cycle [7M]
Time(hrs) : 0-6 6-10 10-12 12-16 16-20 20-24
Load (MW) : 40 50 60 50 70 40
Draw the load curve and find (i) maximum demand, (ii) units generated per day and (iii) average load and load factor

Or

10 a) Explain how a load duration curve is plotted. What is its use? [7M]

b) An industrial organization takes a steady load of 2 MW at a p.f. of 0.75 lagging and pays Rs. 125 per annum per KVA of maximum demand. Determine the capacity of the phase advancing equipment required for minimum overall annual expenditure if the phase advancing equipment costs Rs. 200 per KVAR. An interest and depreciation charge on phase advancing equipment is 10%. Also, determine the new p.f. of the supply. [7M]

Code No: R2022023 **R20** **SET - 4**

II B. Tech II Semester Regular/Supplementary Examinations, July - 2023
POWER SYSTEM-I
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1 a) Explain the essential requirements in the design of thermal power station. [7M]

b) Explain the importance of an super heaters in a thermal power station with a neat diagram. [7M]

Or

2 a) Distinguish between the hydro and thermal power plant with its neat sketch. [7M]

b) Explain the principle operation of the hydro electric plant. [7M]

UNIT-II

3 a) Describe the nuclear chain reaction. [7M]

b) Explain the working of Pressurized Water Reactor(PWR) with a neat diagram. [7M]

Or

4 a) What are the types of nuclear reaction? Describe briefly [7M]

b) Explain in details which location is correct for the nuclear power station installation. [7M]

UNIT-III

5 a) What is sectionalized single bus bar? Explain its operation in detail with help of suitable diagram. [7M]

b) Explain in detail about constructional aspects of gas insulated substation. [7M]

Or

6 a) Explain with a neat lay out diagram of bus bar with one and two circuit breakers. [7M]

b) Write the comparison of air insulated substations and gas insulated substations along with its advantages and disadvantages. [7M]

UNIT-IV

7 a) Draw the cross section of a 3-core belted high voltage cable and describe its various parts. [7M]

b) A 3-phase, single core 132 kV cable has a conductor diameter of 3.2 cm and a sheath of inside diameter 9 cm. If two inte sheaths are introduced in such a way that the stress varies between the same maximum and minimum in the three layers. Find i) Positions of inters heaths ii) voltage on the inters heaths iii) Maximum and minimum stress [7M]

Or

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8 a) Derive the expression for calculation of the insulation resistance. [7M]

b) 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 frequency as 50Hz. [7M]

UNIT-V

9 a) Describe different types of tariff commonly used in practice. [7M]

b) The equipment in a power station costs Rs 15,50,000 and has a salvage value of Rs 60,000 at the end of 25 years. Determine the depreciated value of the equipment at the end of 20 years on the following methods. [7M]
i) Diminishing value method
ii) Sinking fund method at 5% compound interest annually.

Or

10 a) Define and explain the importance of the following terms in generation: [7M]
i) connected load ii) demand factor iii) average load.

b) Calculate annual bill of a consumer whose maximum demand is 100kW, power factor = 0.8 lagging and load factor = 50%. The tariff used is Rs 75 per of maximum demand plus 20 paise per kWh consumed. [7M]