**SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR**

Siddharth Nagar, Narayanavanam Road – 517583

**AUTONOMOUS**

# QUESTION BANK (DESCRIPTIVE)

**Subject with Code :** PS-I(**18EE0210**) **Course & Branch**: B.Tech - EEE

**Year & Sem :** III-B.Tech & I-Sem **Regulation:** R18

## UNIT –I

## THERMAL, HYDRO AND NUCLEAR POWER GENERATING SYSTEMS

1. Draw the schematic diagram of a modern steam power station and explain its operation in detail [L3][CO1][10M]
2. Draw the block diagram of thermal power station (TPS) showing paths of coal,steam,water,air,ash and flue gases and explain principle of operation briefly. [L3][CO1][10M]
3. (a) What factors are taken into account while selecting the site for a steam power plant. [L2][CO1][10M]

   (b) Explain the important components of a steam power station. [L2][CO1][10M]
4. Explain the function of the following in thermal power plant and explain the principle of operation of each. (i)economizer (ii)Electrostatic precipitator (iii)condenser (iv)super heater(v) cooling tower [L2][CO1][10M]
5. Draw a neat schematic diagram of a hydro-electric plant and explain the functions of various components. [L3][CO1][10M]
6. Draw the schematic diagram of a nuclear power station and discuss its operation. [L3][CO1][10M]
7. Write Short notes on [L2][CO1][10M]

   (a) Fast Breeder Reactor (b) Pressurized Water Reactor (c) Boiling Water Reactor
8. Discuss the following components in nuclear power station briefly. [L2][CO1][10M]

   (a) Moderator (b) Control rods (c) Reflector (d) Coolant (e) Nuclear reactor
9. Compare Thermal, Hydro and Nuclear power stations on the basis of technical, mechanical and economic aspects. [L2][CO1][10M]
10. (a) Describe the functions of moderator and control rods [L1][CO1][5M]

    (b) Describe the significance of surge tank in hydro power plant [L1][CO1][5M]

    (c) Discuss the merits and demerits of thermal power plant [L1][CO1][5M]

    (d) List the factors for selection of site for hydroelectric power plants [L1][CO1][5M]

    (e) Discuss the disadvantages of nuclear power plant [L1][CO1][5M]

# UNIT-II
# POWER FROM RENEWABLE ENERGY

1. Explain principle of operation and working of Wind Power Plant. [L2][CO2][10M]

2. Explain the following w.r.t. wind power
   (a) Horizontal axis wind mills (b) Vertical axis wind mills [L2][CO2][10M]

3. Derive the expression for power developed due to wind? Discuss the advantages and disadvantages of horizontal and vertical axis wind mill. [L3][CO2][10M]

4. Explain the principle of operation and working of Tidal Power Plant with neat schematic diagram [L2][CO2][10M]

5. Explain working and construction of Solar Photo Voltaic Power System. [L2][CO2][10M]

6. Explain the principle of operation and working of Solar Thermal System. [L2][CO2][10M]

7. Explain the principle of operation and working of Geo-thermal power generating system. [L2][CO2][10M]
8. Draw the block diagram of Bio-gas power plant and Explain construction, working of Bio-gas power systems [L3][CO2][10M]

9. Explain the following tariff methods briefly . [L2][CO3][10M]
   (i)Flat rate (ii) Block-rate (iii) Two-part (iv) Three-part (v) Power factor

10. The maximum demand of a consumer is 20A at 220V and his total energy consumption is 8760kWh. If the energy charges at the rate of 20 paise per unit for 500 hours use of the maximum demand per annum plus 10 paise per unit for additional units. Calculate (i) annual bill (ii) equivalent flat rate. [L3][CO3][CO2]

11. An electric supply company having a maximum load of 50MW generates $18X10^7$ units per annum and the supply consumers have an aggregate demand of 75MW. The annual expenses including capital charges are
    For fuel = Rs 90 lakhs
    Fixed charges concerning generation = Rs 28 lakhs
    Fixed charges concerning transmission & distribution = Rs 32 lakhs
    Assuming 90% of the fuel cost is essential to running charges and the loss in transmission and distribution as 15% of kWh generated, deduce a two part tariff to find the actual cost of supply to the consumers. [L3][CO2][10M]

12. (a) Define demand factor and load factor. [L1][CO2][10M]
    (b) Write different types of tariff methods. [L1][CO3][10M]
    (c) Sketch the V-I characteristics of solar panel. [L1][CO2][10M]
    (d) Write the applications and advantages of biogas. [L1][CO2][10M]
    (e) Describe the major disadvantages of geothermal power generation. [L1][CO2][10M]

# UNIT –III
# PERFORMANCE OF TRANSMISSION LINES

1. Derive equivalent mathematical expression for voltage regulation of a short transmission line with the help of phasor diagram. [L2][CO4][10M]
2. A single phase overhead transmission line delivers 1100kW at 33kV at 0.8 p.f. lagging. The total resistance and inductive reactance of the line are 10 ohm and 15 ohm respectively. Determine (i) Sending end Voltage (ii) Transmission Efficiency [L2][CO4][10M]

3. A 100km long,3-phase,50Hz transmission line has following line constants: Resistance/ph/km=0.1ohm,Reactance/ph/km=0.5ohm, Susceptance/ph/km=$10*10^{-6}$siemen.If the line supplies load of 20MW at 0.9 p.f lagging at 66KV at the receiving end, calculate(i) Sending end power factor (ii) % regulation (iii)Transmission efficiency. By using nominal Π method [L3][CO4][10M]
4. Derive expression for voltage regulation of medium transmission lines using nominal -T method with equivalent circuit and necessary phasor diagram. [L2][CO4][10M]

5. A 3-phase, 50Hz overhead transmission line 100km long has the following constant: Resistance/km/phase= 0.1 ohm Inductive reactance/km/phase= 0.2 ohm Capacitive susceptance/km/phase = $0.04 \times 10^{-4}$ siemen Determine (i) sending end current (ii) sending end voltage (iii) sending end power factor (iv) transmission efficiency when supplying a balanced load of 10,000kW at 66kV, 0.8 power factor lagging. Use nominal-T method. [L3][CO4][10M]

6. Derive expression for voltage regulation of medium transmission lines using nominal -π method with equivalent circuit and necessary phasor diagram. [L2][CO4][10M]

7. A 3-phase, 50Hz, 150km line has a resistance, inductive reactance and capacitive shunt admittance of 0.1 ohm, 0.5ohm and $3x10^{-6}$ siemen per km per phase. If the line delivers 50MW at 110kV and 0.8 p.f. lagging. Determine the (i) Sending end Voltage (ii) voltage regulation (iii) sending end current. Use nominal-II method for this problem. [L2][CO4][10M]

8. Derive expressions for sending end voltage and sending end current for along transmission line using rigorous method. [L3][CO4][10M]

9. Derive the ABCD constants for long transmission lines. [L2][CO4][2M]
10. a) Describe the voltage regulation in transmission line. [L1][CO4][2M]

    b) Define transmission efficiency. [L1][CO4][2M]

    c) Discuss transmission lines classification [L1][CO4][2M]

    d) Determine the ABCD constants for short transmission line. [L1][CO4][2M]

    e) Draw the phasor diagram for nominal Π method. [L1][CO4][2M]

## UNIT –IV
## MECHANICAL DESIGN OF TRANSMISSION LINES

1. (a). Explain various types of insulators with neat diagrams and compare them [L2][CO5][5M]

   (b). A three phase overhead line is suspended by a suspension type insulator, which Consists of three units. The potential across top unit and middle unit are 12 kv and 18 kv Respectively. Calculate: (i) the ratio of capacitance between pin and earth to the self Capacitance of each unit (ii).The line voltage and (iii) String efficiency. [L2][CO5][5M]

2. (a) What are the factors affecting corona? And derive the expressions for critical disruptive and visual critical voltage [L2][CO5][4M]

   (b) Determine the corona characteristics of a 3-phase line 160km long, conductor diameter 1.036cm, 2.44m delta spacing, air temperature 26.67oC, altitude 2440m, corresponding to an approximate barometric pressure of 73.15cm of Mercury, operating voltage 110kv at 50Hz. Assume data if required.(irregularity factor etc.) [L3][CO5][6M]

3. (a) Derive the expression for sag and tension when the supports are at unequal heights [L2][CO5][5M]

   (b) An overhead transmission line at a river crossing is supported from two towers at heights of 40m and 90 m above water level. The horizontal distance between the towers being 400m.If the allowable tension is 2000kg, find the clearance between the conductor and water at a point mid-way between the towers. Weight of conductor is 1kg/m [L2][CO5][5M]

4. (a) A string of six insulator units has a self capacitance is equals to 10 times the pin to earth capacitance. Find (i) voltage distribution across various units as a percentage of total voltage across the string. (ii) the string efficiency. [L2][CO5][5M]

   (b) A certain 3-phase equilaterally spaced transmission line has a total corona loss of 55KW at 110 KV and a loss of 110KW at 120 KV. detemine the disruptive critical voltage between lines? What is the corona loss at 125KV? [L2][CO5][5M]

5. (a) Each line of a three phase system is suspended by a string of three identical insulators of self capacitance of C farad. The shunt capacitance of connecting metal work of each insulator is 0.2C to earth and 0.1C to line. Calculate the string efficiency of the system and also calculate string efficiency if a guard –ring increases the capacitance to the line of metal work of the lowest insulator to 0.3C [L2][CO5][5M]

   (b) What do you understand by grading of insulators? Explain. [L1][CO5][5M]

6. (a) Write a short note on (i) effect of Wind and ice loading on calculation of sag and (ii) sag-template [L1][CO5][5M]

(b) An overhead line erected across a span of 250 meters on level supports. The conductor has a diameter 1.4cm and has a dead weight of 1.9kg/m. The line is subjected to wind pressure of 37.8 kg/$m^2$ of projected area. The radial thickness of ice is 1.3cm.calculate (i) the sag in an inclined direction (ii) the sag in vertical direction. Assume maximum working stress 1050kg per sq. cm. One cubic meter of ice weight 913.5kg. [L3][CO5][5M]

7. (a) Explain about the improvement of string efficiency by grading of units and guard ring [L2][CO5][5M]

(b) An overhead line has a span of 150 m between level supports. The conductor has a cross sectional are of 2$cm^2$. The ultimate strength is 5000kg/$cm^2$ and safety factor is 5. The specific gravity of the material is 8.9gm/$cm^3$. The wind pressure is 1.5kg/m. calculate the height of the conductor above the ground level at which it should be supported if a minimum clearance of 7 m is to be left between the ground and the conductor. [L2][CO5][5M]

8. (a) Derive the expression for sag for equal supports [L2][CO5][5M]

(b) Each conductor of a three phase over head line is suspended from a cross arm of a steel tower by a string of 4 suspension insulators. The voltage across the second unit is 14.2kv and across the third 20kv. Find the voltage between the conductors and the string efficiency. [L2][CO5][5M]

9. (a) Explain the concept and phenomenon of corona. [L2][CO5][4M]

(b) Write short notes on String chart. [L2][CO5][4M]

10. (a) Define string efficiency [L1][CO5][2M]

(b) What is puncture and flash over in an insulators? [L1][CO5][2M]

(c) Define critical disruptive voltage and visual critical voltage. [L1][CO5][2M]

(d) Describe the sag. Write the formula for sag. [L1][CO5][2M]

(e) Discuss about the corona. [L1][CO5][2M]

# UNIT –V

# CABLES

1. Derive the following (i) Insulation resistance of a cable (ii) Capacitance of a single core cable . [L3][CO6][10M]
2. Write short notes on: (a) Intersheath grading (b) capacitance grading [L1][CO6][10M]
3. (a) What are the limitations of belted cable? How these are can be overcome in pressurized cables? [L1][CO6][5M]

   (b) A33KV single core cable has a conductor diameter of 10mm and sheath of inside diameter of 40mm. find the maximum and minimum stress in the insulation. [L2][CO6][5M]

4. (a) Distinguish between Underground cables and overhead lines. [L2][CO6][5M]

   (b) Explain the pressure cables with a neat sketch. [L2][CO6][5M]

5. (a) Show that in a three core belted cable the neutral capacitance to earth conductor $C_n$ is equal to $C_s+3C_c$ where $C_s$ and $C_c$ are capacitances of each conductor to sheath and to each other respectively. [L2][CO6][5M]

   (b) Show that the ratio of maximum potential gradient to the minimum potential gradient is R/r. Where r and R are the conductor radius and sheath radius. [L3][CO6][5M]

6. (a) Distinguish between the advantages & disadvantages of underground cable over overhead lines. [L2][CO6][5M]

   (b) The maximum and minimum stresses in the dielectric of a single core cable are 40kv/cm (r.m.s) and 10kv/cm (r.m.s) respectively. If the conductor diameter is 1cm, find: (i) Thickness of insulation & (ii) Operating voltage. [L3][CO6][5M]

7. (a) What is the necessity of grading of cables? Explain briefly the various grading methods of cables**?** [L2][CO6][5M]

   (b) Explain the classification of cables. [L2][CO6][5M]

8. (a) Derive a relation between the conductor radius and inside sheath radius of a single core cable so that the electric stress of the conductor surface may be minimum. [L2][CO6][5M]

   (b) A cable has been insulated with two insulating materials having permittivity of 6 and 4 respectively. The inner and outer diameter of a cable is 3cms and 7cms. If the dielectric stress is 50kV/cm and 30kV/cm, calculate the radial thickness of each insulating layer and the safe working voltage of the cable. [L3][CO6][5M]

9. Explain the construction of underground cables. [L2][CO6][10M]

10. (a) What is a cable? What types of insulating materials are used in cables? [L1][CO6][2M]

    (b) what is a dielectric test? [L1][CO6][2M]

    (c) Draw 3-core cable and indicate its parts. [L1][CO6][2M]

    (d) Classify the cables based on voltage and type of insulating materials used in them [L1][CO6][2M]

    (e) Write a short note on screened cable [L1][CO6][2M]

Prepared by: K.GUNAPRASAD