BTEIC402 : Power System

Unit 1: Electrical Power Generation

1. Writeashortnoteonthegenerationofelectricalenergy
2. Discussthedifferentsourcesofenergyavailableinnature
3. Whatisasteampowerstation?Discussitsadvantagesanddisadvantages
4. Drawtheschematicdiagramofamodernsteampowerstationandexplainitsoperation.
5. Explaintheimportantcomponentsofasteampowerstation.
6. Whatfactorsaretakenintoaccountwhileselectingthesiteforasteampowerstation?
7. Discussthemeritsanddemeritsofahydro-electricplant.
8. Drawaneatschematicdiagramofahydro-electricplantandexplainthefunctionsofvariouscomponents.
9. Drawtheschematicdiagramofanuclearpowerstationanddiscussitsoperation.
10. Discuss the factors for the choice of site for a nuclear power plant.
11. Write note on major electrical equipments in generating stations
12. What is an excitation system on an AC alternator

Unit 2: Electrical Design of Overhead Transmission Line

1. What do you understand by the constants of an overhead transmission line?
2. Derive an expression for the loop inductance of a single phase line.
3. Derive an expression for the inductance per phase for a 3-phase overhead transmission line when conductors are symmetrically placed
4. Derive an expression for the inductance per phase for a 3-phase overhead transmission line when conductors are unsymmetrically placed but the line is completely transposed
5. What is corona? What are the factors which affect corona?
6. Discuss the advantages and disadvantages of corona.
7. Describe the various methods for reducing corona effect in an overhead transmission line.
8. Definea) Skin Effect b) Proximity Effect c) Ferranti Effect
9. Derive an expression for the capacitance of a single phase overhead transmission line.

10. A single phase transmission line has two parallel conductors 3 m apart, the radius of each conductor being 1 cm. Calculate the loop inductance per km length of the line if the material of the conductor is
    (i) copper (ii) steel with relative permeability of 100.
11. A 200 km, 3-phase transmission line has its conductors placed at the corners of an equilateral triangle of 2·5 m side. The radius of each conductor is 1 cm. Calculate
    i) line to neutral capacitance of the line,
    ii) charging current per phase if the line is maintained at 66 kV, 50 Hz.

Unit 3: Mechanical Design of Transmission Lines

1. Nametheimportantcomponentsofanoverheadtransmissionline.
2. Discussthevariousconductormaterialsusedforoverheadlines.Whataretheir relativeadvantagesanddisadvantages?
3. Discuss the various types of line supports.
4. Discussthe advantages and disadvantagesof (i) pin-type insulators(ii) suspension type insulators.
5. Defineandexplainstringefficiency. Explainvariousmethodsofimprovingstringefficiency.
6. Whatisasaginoverheadlines?
7. Deduce an approximate expression for sag in overhead lines when
    a. supports are at equal levels
    b. supportsareatunequallevels.
8. A132kVtransmissionlinehasthefollowingdata:
    Wt.ofconductor=680kg/km ; Length of span = 260
    mUltimatestrength=3100kg ; Safety factor = 2
    Calculatetheheightabovegroundatwhichtheconductorshouldbesupported.Groundclearance requiredis10meters.

9. In a33 kV overhead line,there are three unitsin the string ofinsulators.If the capacitancebetweeneachinsulatorpinandearthis11%ofself-capacitanceofeachinsulator,find (i)thedistributionofvoltageover3insulatorsand(ii)stringefficiency.
10. Each line of a 3-phase system is suspended by a string of 3 similar insulators. Ifthevoltageacrossthelineunitis17·5kV,calculatethelinetoneutralvoltage.Assumethattheshuntcapacitancebetweeneachinsulatorandearthis1/8thofthecapacitanceoftheinsulatoritself.Alsofindthestringefficiency.

<u>Unit 4:</u> Performance of Transmission Lines

1. Give the classification and Representation of transmission lines.
2. Deduce an expression for voltage regulation of a short transmission line, giving the vector diagram.
3. Showhowregulationandtransmissionefficiencyaredeterminedformediumlinesusing endcondensermethod Illustrateyouranswerwithsuitablevectordiagrams.
4. Showhowregulationandtransmissionefficiencyaredeterminedformediumlinesusing nominal*T*method Illustrateyouranswerwithsuitablevectordiagrams.
5. Showhowregulationandtransmissionefficiencyaredeterminedformediumlinesusing nominalπ method Illustrateyouranswerwithsuitablevectordiagrams.
6. Usingrigorousmethod,deriveexpressionsforsendingendvoltageandcurrent foralongtransmission1ine.
7. Whatdoyouunderstandbygeneralizedcircuitconstantsofatransmissionline?Whatistheirimportance?
8. Evaluatethegeneralizedcircuitconstantsfor
    a. shorttransmissionline
    b. mediumline—nominal*T*method
    c. mediumline—nominalπmethod
9. What is the maximum length in km for a 1-phase transmission line having copper conductor of 0·775 cm^2 cross-section over which 200 kW at unity power factor and at

3300V are to be delivered ? The efficiency of transmission is 90%.Take specific resistance as 1.725$\mu\Omega$*cm.*

10. A(medium)singlephasetransmissionline100kmlonghasthefollowing constants: Resistance/km=0·25ΩReactance/km= 0·8 Ω Susceptance/km =14 ×10^{-6}siemen; Receiving end line voltage = 66,000 VAssumingthatthetotalcapacitanceofthelineislocalizedatthereceivingendalone, determine(i)thesendingendcurrent(ii)thesendingendvoltage(iii)regulationand(iv)supplypowerfactor.Thelineisdelivering15,000kWat0.8powerfactorlagging.Drawthephasordiagramtoillustrateyourcalculations.
11. A3-phase,50-Hzoverheadtransmissionline100kmlonghasthefollowing constants: Resistance/km/phase=*0.1*Ω

    Inductivereactance/km/phase=*0·2*Ω

    Capacitive susceptance/km/phase=*0·04*× 10^{-4}*siemen*

    Determine (i) the sending end current (ii) sending end voltage (iii) sending end power factorand (iv) transmission efficiency when supplying a balanced load of 10,000 kW at 66 kV, p.f. 0·8lagging.UsenominalTmethod.
12. A 3-phase, 50Hz, 150 km line has a resistance, inductive reactance and capacitiveshuntadmittanceof0·1Ω,0·5Ωand3×10^{-6}Sperkmperphase.Ifthelinedelivers50MWat110kVand0·8p.f.lagging,determinethesendingendvoltageandcurrent.Assumeanominalπcircuitfortheline.
13. Findthefollowingforasinglecircuittransmissionlinedeliveringaloadof50MVAat110kVandp.f.0·8lagging:

    (i)sendingendvoltage(ii)sendingendcurrent(iii)sendingendpower(iv)efficiencyoftransmission.Given A=D= 0·98$\angle$3°;B=110$\angle$75°ohm;C=0·0005$\angle$80°siemen.

<u>Unit 5:</u> AC & DC Distribution

1. Defineandexplaintheterms:feeder,distributorandservicemains.

2. Explainthefollowingsystemsofdistribution:
    a. Radialsystem
    b. Ringmainsystem
    c. Interconnectedsystem
3. Discussbrieflythedesignconsiderationsindistributionsystem.
4. Withaneatdiagram,explainthecompletea.c.systemfordistributionofelectricalenergy.
5. Describebrieflythedifferenttypesofd.c.distributors.
6. Explain3-wired.c.systemofdistributionofelectricalpower.
7. Derive an expression for the voltage drop for a uniformly loaded distributor fed at one end.
8. Describebrieflyhowwillyousolvea.c.distributionproblems?
9. Write Short note on ground detector
10. Explain three phase unbalanced load in details
11. What are the advantages of 3-wire distribution over 2-wire distribution?