Electrical quiz 8

www.elecspot.com

Contribution by: C.Kaliaperumal,Former Chief Engineer/TNEB/India

31. What is the formula for the emf induced in a transformer?
EMF induced in primary winding
E1(rms) = 4.44fN1 Φm.
Similarly, EMF induced in secondary winding E2(rms)=4.44fN2 Φm.
where,Φm = Maximum flux in the core in Wb= (Bm x A),
f:frequency.N2:Number of windings in the secondary.

32. What are the fundamental principles adopted in transformers?
Primary Power (V1*I1) =Secondary Power(V2*I2)
V1*I1=V2*I2.(Neglecting the losses).
V1/V2 = I2/I1
Primary Magneto Motive Force(MMF) N1*I1=Secondary MMF (N2*I2).
N1*I1=N2*I2.
N1/N2 =I2/I1.
There fore,V1/V2=N1/N2=I2/I1=K.
If N2 > N1, i.e. K > 1,
then the transformer is step-up transformer.
If N2 < N1, i.e. K < 1,
then the transformer is step-down transformer.

33. What are Instrument Transformers?
Instrument Transformers are used in AC system for measurement of electrical quantities, i.e. voltage, current, power, energy, power factor, frequency through the measuring instruments designed for 5 A ,1 A and 110 V. Also used with protective relays for protection of power system. Basic function of Instrument transformers is to step down the AC power system high voltage and current as it is impossible to design the meters and relays for measuring such high level voltage and current.
Current Transformer (C.T.):
Used to step down the current of the power system to a lower level to make it feasible in the measurable and monitoring range of 1 A or 5 A for various meters & protective relays ,viz. directional, distance relays, transformer protection relays, etc.
Potential Transformer (P.T.):

Used to step down the voltage of power system ,viz,11,22,33,110,230 kV to a lower level of 110 V to make it feasible to be measured by small rating of voltmeter ,energy meter, etc and protective relays as required.

34.What is the main difference between CT and PT?
C.T. is having very few turns or bar primary. Primary is connected in series with the power circuit and hence called as series transformer.
The metering & protection secondary , having large no. of turns and connected directly to an ammeter, energy meter, etc and protective relays respectively. As the ammeter is having very small resistance and could not balance with the ampere turns of the primary as the primary load current is independent and secondary current is only the replica of the load current, the CTsecondary must be either in circuit or shorted.
One terminal of CTsecondary is grounded to avoid heavy voltage on secondary with respect to earth in view of safety of devices and personnel.
P.T. Primary have large no. of turns and connected across the line and ground , parallel with the supply. P.T. Secondary, having few turns and connected directly to voltmeter, energy meter and relays as required.
As the voltmeter is having high resistance , the PT secondary operates almost in open circuited condition. The neutral terminal of the PT secondary is grounded to maintain the secondary voltage with respect to earth for the safety of operators.

35. What is the general and prior requirement of transformers?
a. Longer life and higher operating efficiency.
b. Very rugged and shall be capable of withstanding a great deal of abuse.

36. What is the main cause for most transformer failures apart from worst procurement?
Lack of attention on periodic inspection of transformers and
testing of oil

37.Which furnishes one half of the insulation strength of the transformers?
Transformer oil,I.S.335,

38.What is the Break Down Voltage (BDV) of Transformer oil?
The oil must withstand not less than 40 kV with a gap of 2.5 mm between 5/8th inch brass sphere.

39. What is the best method for dehydrating the transformer oil?

By pumping and passing the oil through the filter press(several thickness of blotting paper) in a vacuum chamber ,that is oil filtering machine.

40. In which quantity,the short circuit of turns or layers in an electrical equipment reflect?
In decrease of winding resistance.

41. What is the general principle of operation of Voltage Regulators?
By changing the mutual inductance between the primary and secondary winding of the transformer either through mechanical means or by changing their turns ratio slightly through cutting in or out of certain turns ,mostly in HV winding.