SHREE DATTA SHETKARI SAHAKARI KARKHANA LTD. CHARITABLE TRUST

SHREE DATTA POLYTECHNIC COLLEGE, DATTANAGAR

CLASS TEST-02 Model Answer paper

Name of subject: ECA **Subject Code**-12150

Mark: 25 **Course Code**: EE5E(OTO)

Institute Code: 1512 **Time:**01:00 hr.

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1 Attempt any two of following **8 marks**

a)State the benefits of using energy efficient motor

ANS: Following are the benefits of using energy efficient motor-

1) Longer insulation life.
2) Longer bearing life.
3) Lower heat output.
4) Less vibrations.
5) Low losses.
6) Longer warranties.
7) Decreases energy costs.
8) Pollution free.
9) High efficiency.
10) Good performance.

b). State the methods of energy conservation in transformer.

ANS: Following are the methods of energy conservation in transformer-

1) Use Energy efficient transformer.

2) Use amorphous metal transformer.

3) Use Encapsulated dry type transformer.

4) Use tapped transformer, usually auto wound.

5) Use thin laminations in transformer core.

6) Periodic maintenance of transformer.

c). State different technical losses in transmission system. How these losses can be reduced

ANS: Different technical losses in transmission system-

1) Insufficient investment on transmission & distribution system, & result is overvoltage.

2) Random growth of sub transmission &distribution system.

3) Large scale rural electrification through long 11KV & LT lines.

4) Many stages of transformation.

5) Improper load management.

6) Unsatisfactory reactive power compensation.

7) Poor quality of equipment used.

These losses can be reduced by-

Short term measures:-

1) Identification of the weakest area in distribution system.

2) Improving of weakest area for maximum benefits of the limited sources.

3) Installation of additional distribution transformer.

4) Installation of shunt capacitors for improvement of power factor.

5) Use energy efficient transformer.

Long term measures:-

1) Detailed mapping of total primary & secondary distribution system.

2) Describing the various parameters such as conductor size, line length etc.

3) Compiling of data regarding existing loads, operating conditions, Expected future loads.

4) Preparation of long term plans for phase strengthening.

5) Estimation of financial requirements for improvement..

Q.2 Attempt any two of following 8 marks

a) State & list four methods for improving energy scenario in the present situation in our Country.

ANS: Following are the methods for improving energy scenario in the present situation in our Country.

1) Use energy efficient luminaries.

2) Use energy efficient Motors, soft starters, rewinding of motors.

3) Use energy efficient transformers.

4) Reactive power compensation.

5) Balance phase current, reduce technical & commercial losses.

6) Reduce ozone layer depletion, global warming, air pollution & acid rain etc.

7) Use energy flow diagram to detect losses.

8) Follow IE rules& regulations.

b) Define luminous intensity, luminous efficiency, coefficient of utilisation & depreciation factor.

ANS: 1) Luminous intensity:- The luminous flux emitted by light source per unit solid angle is called as the luminous intensity.

2) Luminous efficiency:- This is the ratio of luminous flux emitted by a lamp to the power consumed by the lamp.

3) Coefficient of utilisation:- A coefficient of utilization is a measure of the efficiency of a luminary in transferring luminous energy to the working plane in a particular area.

4) Depreciation factor:- The ratio of initial illumination on an area to the present illumination of the same area, used in lighting calculations to account for depreciation of lamp intensity and reflective surfaces.

c) State two benefits & applications of variable frequency drive.

Ans.Following are the benefits of variable frequency drive:

1) Energy saving.

2) Better process control.

3) Cost saving.

4) Less maintenance cost.

5) Large life for bearing & motors.

6) Improved power quality

Following are the applications of variable frequency drive:

1) Centrifugal pumps

2) Pumps

3) Conveyers

4) Machine tools

Q.3 Attempt any three of following 9 marks

a) Explain the use of amorphous metal & its advantages.

ANS: Use of amorphous metal-

1) Amorphous metal is an energy efficient metal. This metal containing ferromagnetic elements such as iron or cobalt alloy.

This material has high electrical resistivity. Result is low core losses.

2) Amorphous metal has lower hysteresis losses. Result is less energy wasted in magnetising & demagnetising during each cycle of supply current.

3) Amorphous metal have very thin laminations. Result is lower the eddy current losses.

4) This metal reduces impact on global environment. This metal improves electrical characteristics.

Advantages of amorphous metal:-

1) Up to 75% energy saving using amorphous metal than conventional metal.

2) Reduced carbon dioxide emission.

3) Reduction in fossil fuel consumption.

4) Reduced magnetising current.

5) Better overload capacity.

6) High Reliability.

7) Excellent short circuit capacity.

8) Less maintenance cost.

b) State the periodical maintenance necessary in power transformers, how does it result in energy conservation.

ANS: A) Hourly maintenance:-

1) Check Winding temperature, ambient temperature & oil temperature.
   B) Daily maintenance:-
   1) Check oil level, if low, fill dry oil.
   2) Check silica gel in the breather. Colour should be blue.
   C) Quarterly maintenance:-
   1) Check for proper working of cooling fans, circulating pumps etc.
   2) Clean bushing. Tighten the connections.
   D) Half yearly:-
   1) Check dielectric strength of oil.
   2) Check bushes & insulators.
   3) Check cable boxes/ filter/replace oil.
   4) Check earth resistance.
   5) Check lightning arrestors.
   E) Yearly maintenance:-
   1) Check oil for acidity.

2) Check alarms, relays, contacts.
3) Check lightning arrestors.
F) Five yearly maintenance:-
1) Carryout overall inspection of the transformer including lifting of core & coils.
2) Clean the transformer with dry transformer oil.
3) Open the transformer for cleaning & re-assembling.
From considering all above points, it is easy to improve performance, Quality & efficiency of
transformer. This reduces losses , energy wastage & saving the energy.

c) State the need for co-generation & list its advantages

Ans. Need for co-generation-

-In conventional power plant efficiency is only 35% & remaining 65% of energy is lost.

-The conventional system uses energy of fuel to produce Electrical energy or Thermal energy. Where as co-generation system produces both electrical energy & thermal energy from same flues.

-The overall efficiency of energy use in co-generation can be up to 85% and above.

-Lower volumes of CO_2 emissions compared to the conventional system where separate production of electricity & heat.

-In co-generation system, heat generated is by-product in electricity generating process. This heat can be used for other processes. Due to this energy cost are lowered.

-Limited need of cooling water in co-generation system therefore reduces thermal pollution

Advantages of co-generation system-

1) Co-generation can meet both power & heat needs.

2) Less costly.

3) Very high efficiency.

4) Reduction in emission of pollutants due to reduced fuel consumption.

5) A much more efficient use of primary energy can be achieved than with a separate production

of electricity & heat.

6) In this system heat generated is by-product in electricity generating process.

7) It can maintain grid stability.

8) Due to decentralization of electricity it avoids transmission losses & makes system more

flexible.

d) List six objectives of tariff.

ANS: Following are the objectives of tariff-

1) Cost of investment in generation, transmission & distribution equipment must be recovered.

2) Cost of operation, supplies, maintenance & losses must be recovered.

3) Cost of metering, billing, collection & miscellaneous services must be recovered.

4) It should be simple to the public.

5) It should be uniform over large population.

6) It should provide incentive for using power during the off peak hours.

7) It should have a provision for higher demand charges for high load demanded at system peak.

8) Should have a provision of penalty for low power factor.

9) There is a suitable profit on the capital investment.