

राजकीय पॉलिटेक्निक महाविद्यालय, करोंली
विद्युत विभाग

IInd - Mid term test

Subject - Power System - III

Code - EE-308

Max. Marks - 15

Date - 19/01/2018

* Attempt any three questions.

Q. (1) What is Tariff? Explain different types of tariff

Q. (2) What is Power factor? Explain the causes of Low Power factor

Q. (3) Discuss the objectives of Tariff?

Q. (4) Explain the effects of Low power factor? Write the names of different method of improving power factor.

Solution:

Ans. (1) Tariff → The rate at which electrical energy is supplied to a consumer is known as Tariff.

The following factors are taken in account to decide Tariff-

- (a) Types of Load - (i) Domestic
(ii) Commercial
(iii) Industrial

(b) maximum demand.

(c) Time at which load is require.

(d) Power factor of Load

(e) Amount of energy used.

Types of Tariff →

(1) flat rate Tariff → It will depend only on maximum demand. It is independent of energy consumed. This system is used in street lighting. It can be expressed by

$$C = Ax.$$

(2) Block meter rate Tariff → In the system energy consumption

is divide into block price per unit is fixed for each other. The price per unit is first block is highest and decrease for other blocks. This type of tariff is that the consumer get incentive to consume more energy.

(3) Two-Part tariff \rightarrow When the rate of electrical energy is charge on the basis on the basis of maximum demand of the consumer and the unit consumed, it is called

(1) Hopkinson tariff.

$$C = Ax + By$$

(2) (1) Semi-fixed charge

(2) (2) Running charge

(4) Seasonal Rate tariff \rightarrow Seasonal Rate tariff specify higher price per kwh used during the season of year in which the system peak occurs. This is known as on-peak season.

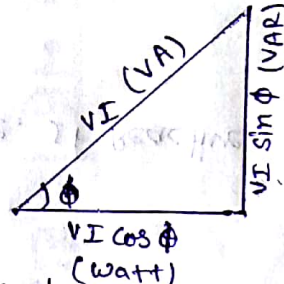
(5) Power factor tariff \rightarrow The tariff in which power factor of consumer is taken in consideration. In this system consumer is force to improve the power factor of the load. Low power will increase the kVA.

Ans (2) \rightarrow Power factor \rightarrow Power factor is the cosine of angle between voltage and current.

* Power factor is the ratio of Active power to the Apparent power.

$$\cos \phi = \frac{\text{Active Power}}{\text{Apparent Power}}$$

$$\cos \phi = \frac{R}{Z}$$



* Causes of low P.F.

- (1) most of the A.C. motor are of inductive type. 3- ϕ I.M. motor operate at a power factor of about 0.8 lagging at full load. At light load these motor work at a very small P.F. of the order of 0.2-0.3 lagging.
- (2) A T.F. draws magnetizing current from the supply. At normal load, this current doesn't effect the power factor much but at light load the primary current power factor is low.
- (3) Arc lamp, electric discharge lamp, industrial heating furnace, welding equipment operate at low lagging power factor.

Ans (3) \rightarrow objective of Tariff \rightarrow

- (1) विद्युत उत्पादन, ट्रांसमिशन एवं वितरण पर सम्पूर्ण वार्षिक व्यय सम्मिलित होना चाहिये।
- (2) सप्लाइ, ऑपरेशन, अनुरक्षण लागत तथा दानियों में हुए वार्षिक व्यय सम्मिलित होने चाहिये।
- (3) पूंजीगत निवेश पर संतोषजनक ब्याज रिटर्न आवश्यक करना चाहिये।
- (4) ज्यादा उपभोक्ता होने पर भी टैरिफ समान होना चाहिये।
- (5) उपभोक्ता विद्युत व्यय को भूयस्य क्षमता से देने में समर्थ हो

- ⑥ विद्युत व्यय की गणना करना थरल दी ताकि उपभोगन की श्रिक आसानी से मजस होके।
- ⑦ विद्युत सभारि से सम्बन्धित अन्य लागत को धर्मित करेना

Ans ① → effects of Low Power factor →

- ① Current flowing through equipment increase.
- ② I²R Power Losses increase.
- ③ Internal heating increase, Require more cooling medium.
- ④ Reactive Power demand increase. size of Generator Capacity (MVA) is more for supply additional Reactive Power.
- ⑤ Transmission line losses increase.
- ⑥ Initial investment on generator increase
- ⑦ Cost of Power per unit increase.
- ⑧ Due to power factor load Reactive Power demand is more. If Reactive Power supply is less which cause VR to decrease.

Methods for improving Power factor :- Power factor का improvement, different ends (Sending End तथा Receiving End) पर different methods का use करने किया जाता है :-

* Sending End power factor improvement Method :-

- (1) By controlling Excitation of Synchronous Generator (Alternator).

* Receiving End Power factor improvement methods :-

- (1) By using Static Capacitors (For Peak
- (2) By using Synchronous Condenser
- (3) By using Phase Advancers
- (4) Shunt Capacitor (For Peak Load Conditions)
- (5) Shunt Reactor (For Light load Conditions)