Government Polytechnic college Karauli
Electrical Dept.
IInd - mid term test
subject - Utilization of electrical power and traction
code - EE302
Date - 16 Jan 2018
Max. marks - 15

Question paper

Attempt any two out of following three questions. Que.(1) is compulsory.

Que.(1) write names of motor used for the following. (1x10) = 10 marks
(i) sewing machine (ii) Refrigerator (iii) Drill machine
(iv) Fan (v) paper mill (vi) Lathe machine (vii) Textile mill
(viii) Lift (ix) Elevator (x) Electric traction

Que.(2) Explain the laws of illumination. [5 marks]

Que.(3) what is electric drive? compare electric drive with mechanical drive. [5 marks]

Solution

Ans.(1) The motors use for following purpose are;

(i) sewing machine: Universal series motor

(ii) Refrigerator: capacitor start induction motor

(iii) Drill machine: squirrel cage induction motor or DC shunt motor.

(iv) Fan: (a) ceiling Fan: Single phase capacitor start induction motor.
(b) Table fan: Universal series motor

(v) paper mill: Three phase induction motor or synchronous motor.

(vi) Lathe machine: squirrelcage induction motor

(vii) Textile mill: totally enclosed three phase induction motor.

(viii) Lift: DC compound motor or slipring induction motor

(ix) Elevator: Double squirrel cage induction or slipring induction motor or DC compound motor.

(x) Electric traction: DC series motor, single phase ac compensated series motor

Ans.(2) **Laws of illumination:** There are two laws of illumination.

(1) Inverse square law (2) Lamert's cosine law.

① **Inverse square law:** If a source of light which emits light equally in all directions be placed at the centre of a hollow sphere, the light will fall uniformly on the inner surface of the sphere. The illumination of a surface is inversely proportional to the square of the distance between the surface and the light source provided that the distance between the surface and source is sufficiently large so that the source can be regarded as a point source.

Let us consider surface A_1 and A_2 at distance r_1 and r_2 from the point source 'S' of luminous intensity I.

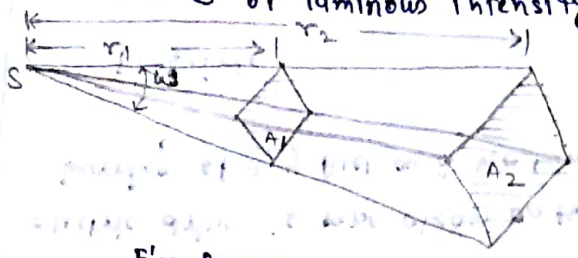

Fig: Inverse square law

Luminous Flux radiated per steradians = I

Total luminous flux radiated = Iw lumens

Illumination on the surface of A_1 = $\frac{Iw}{A_1}$ lumens/unit Area

$E_1 = \frac{Iw}{w r_1^2} = \frac{I}{r_1^2}$ $(\because A_1 = w r_1^2)$

similarly, illumination on the surface of area A_2

$E_2 = \frac{Iw}{A_2} = \frac{Iw}{w r_2^2} = \frac{I}{r_2^2}$ lumens per unit area

② **Lambert's cosine law:** According to this law the illumination at any point on a surface is proportional to the cosine of the angle between the normal at that point and the direction of luminous flux.

Often the illuminated surface is not normal to the direction of light but is inclined. The area over which the light is spread is then increased in the ratio.

$\frac{AB}{AC} = \frac{1}{\cos\theta}$

And the illumination decrease in the ratio

$\frac{\cos\theta}{1}$

Illumination (E) then becomes

$E = \frac{I\cos\theta}{r^2}$

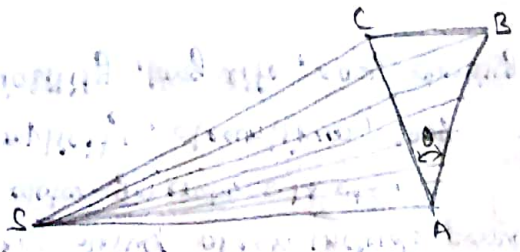

Fig: Lambert's cosine law

Ans. ③ Electric drive :

An electric drive is defined as a form of machine equipment designed to convert electric energy into mechanical energy and provide electrical control of this process. The basic elements of an electric drives are the electric motor, the transmission and the control system. Electric drives often include conversion equipments like frequency changers, rectifier units, motor-generator sets etc.

Electric drive is more popular for its simplicity, cleanliness, easy and smooth control, flexibility in layout, compactness, reliability, long life, easy starting, low cost and facility of remote control etc.

Comparision between electric drive and mechanical drive

Sl no	Electric drive	mechanical drive
1.	Electric drive is dependent of electric supply, electric traction system is tried up to electrified routes only.	It is self-contained unit and therefore can be suitable for any terrain.
2.	In case of failure of supply the whole system will come to result as it is dependent of electric supply	The system is self contained there is no such condition.
	electric drive is more clean as there are burning of any fuel and no fumes.	Mechanical drive requires burning of therefore it may contains ash or fumes.
	Flexible	Not flexible
	Less space required	More space required
	Easily modified as per requirement	Very difficult to modify
	Low maitenance cost due to less no. of mechanical parts	High maintenance cost due to no. of mechanical parts.
	Electric braking much superior and economical	It has few disadvantages like wear and tear