ESL 720 Energy Conservation

MAJOR TEST

PART C

TOTAL MARKS : 35

Q1. State if the following statements are TRUE or FALSE. Give reasons for your answers. (Any **TEN**)

(i) The effieieney and life of an induction motor depends loading.
(ii) It is advisable to disconnect some electrical equipments from the main in order to reduee electricity consumption, while for some equipments this does not matter.
(iii) Only about 66% of useful energy may be available at thc load end of an electrical equipment, taking the generation end electrie energy input as 100%.
(iv) Transformer Open eireuit test gives eopper losses and Short cireuit test gives core losses.
(v) The presence of an air gap in a magnetic circuit cause an increase in the current required for creating magnetie flux.
(vi) Instantaneous Power in Single Phase and Three Phase circuits contains a harmonic eomponent.
(vii) The torque developed in an induction motor depends on slip.
(viii) VFD can be effective in saving electrical energy for a range of operating conditions.
(ix) K-Factor transformer can be used for transformer rating under harmonic currents.
(x) Simple payback period method is better than Present Worth Analysis to justify replacing a standard motor with an energy efficient motor.
(xi) The PF under distorted current varies as $\sqrt{\{1 + (THD)^2\}}$.

[20]

2. A 3 Φ, 415 V linc voltage, 6 pole 50 Hz induction motor offers a total resistance of $7.2 \angle 30^{\circ}\ \Omega$ per phase at full load. The per phase stator impedance is $(2.06 + j\ 1.6)\ \Omega$.

Attempt any **FIVE.**

(a) Draw the equivalent eireuit for the motor identifying the different impedances. Determine the stator current for star connection.

(b) Find the effective resistance offered by the rotor side (magnetizing impedance = 10 Ω) and rotor speed in rpm, thc slip being 10%.

(e) Calculate the eapaeitances required to make the power factor unity for star and delta conneetions.

(d) If the motor is being provided using a eable with impedance $1 + j0.5\ \Omega$, find the line voltage at the motor terminals for an inrush eurrent 6 times the full load current with starting PF of 0.3.

(e) Assuming the stator loss to be 33% of the total loss, determine the motor efficiency.

(f) What will be effeet of harmonics on motor losses?

[15]

Part-B (Max. Marks: 10)

Important: Please attempt on separate answer sheets

1. Answer the followings briefly :

i) In a eloth-shop, you want to replace one burnt-out lamp by a new lamp. What precautions you will take, apart from wattage of the lamp?

ii) Mention the difference between Capital Recovery Faetor (CRF) and Sinking Fund Factor (SFF).

iii) Govt. of India has declared ECBC-2006, a couple of years before. What does it relate to ?

iv) What is the problem with thermal insulation when used at low temperature?

v) Why $U_{edge} \geq U_{centre}$ in energy efficient windows?

(5 x 1)

2. A building wall consists of 25 cm. concrete (k=1.75 $Wm^{-1} K^{-1}$) and the room temp. is 23.6 °C. The wet bulb temp. is 16.8 °C, $h_i = 9.4$ W m^{-2} K^{-1} and $h_o = 34$ W m^{-2} K^{-1}

i) What is the temperature on the inside surface of the wall?

ii) Will the moisture condense on the wall?

iii) How many layers of 1.25 cm. thick fiber board insulation (k=1.75 $Wm^{-1} K^{-1}$) should be applied on the inside wall surface to prevent moisture condensation?

(5)