Con. 5376-07.   (OLD COURSE)   CD-8187

(3 Hours)   [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.

(2) Attempt any **four** out of remaining questions.

(3) Assume any data if **necessary**.

1. (a) Explain cogging and crawling in induction motors.   10

(b) Explain mechanical forces in transformer.   10

2. (a) The power input to the ROTOR of a 440 V 50 Hz, 6 pole, 3ϕ induction motor is   10
    80 kW. The rotor emf is observed to make 100 revolution per minute. Calculate
    (i) slip (ii) rotor speed (iii) mechanical power developed (iv) rotor cu loss (v) rotor
    resistance per phase if rotor current is 65 A.

(b) Draw and explain the power stages in 3 phase induction motor. Prove that :   10
    $P_g : P_{cr} : P_m = 1 : s : (1 - s)$ where S is slip.

3. (a) Explain oscillating neutral in transformer.   10

(b) Explain excitation phenomenon in transformer.   10

4. (a) Draw and explain torque speed characteristics of three phase induction motor. Explain   10
    3 zone operation.

(b) What is necessity of starter in three phase induction motor ? Explain autotransformer   10
    starter, star delta starter. Derive their starting torques in terms of starting torque
    for DOL starter.

5. (a) Explain split phase induction motor and capacitor start capacitor run motor. Draw   10
    circuit diagrams, phaser diagrams and torque speed charactristics.

(b) A 230 V, 50 Hz, 4 pole, single phase induction motor has following constants and losses :   10
    $r_1 = 2 \cdot 3\ \Omega$ $r_2 = 4 \cdot 2\ \Omega$ $x_1 = 3 \cdot 2\ \Omega$ $x_2 = 3 \cdot 2\ \Omega$ $x_m = 74\ \Omega$
    Core loss = 98 Watts
    Friction and windage loss = 30 watts
    If the motor is running with a slip of 0·05 at rated voltage and frequency, then compute
    the stater current, pf, power output, torque and efficiency with its auxiliary winding open.

6. (a) Two 3 phase transformers have the following per phase parameters, referred to secondary.   10
    $re_1 = 0 \cdot 004\ \Omega$ $xe_1 = 0 \cdot 018\ \Omega$
    $re_2 = 0 \cdot 002\ \Omega$ $xe_2 = 0 \cdot 012\ \Omega$
    No. 1 transformer is of 500 KVA and No. 2 is of 1000 KVA. They are connected for
    parallel operation. How will they share a load of 1500 KVA at 0·8 pf lag ?

(b) Explain back to back test on transformers.   10

7. (a) Explain deep bar and double cage induction motors.   10

(b) A three phase induction motor at rated voltage, voltage and frequecny has a starting   10
    torque of 160% and maximum torque of 200% of full load torque. Neglect stater
    resistance and rotational losses and assume const. rotor resistance.
    Determine :
    (i) Slip at full load
    (ii) Slip at max torque