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SE-8275

B. E. - III (Sem. V) (Elec.) Examination

May / June – 2011

Electrical Machines - II

(New Course)

Time : **3** Hours] [Total Marks : **100**

Instructions :

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 3 (SEM. 5) (ELECTRICAL)

Name of the Subject :

☛ Electrical Machines - II (New)

☛ Subject Code No. : 8 2 7 5 ☛ Section No. (1, 2,.....) : 1&2

Seat No. :

Student's Signature

1) Attempt all question.
2) Figure to the right indicates full marks.
3) Scientific calculator up to Casio-100D, 100MS series is permitted.

Section-I

Q-1 (a) **Do as Directed** **10**

(1) The slip of an induction motor at blocked rotor test is equal to _____.
(2) Phenomenon of magnetic locking in an induction motor is known as _____.
(3) _____ type of starter is used with slip-ring induction motor.
(4) The rotating magnetic field rotates at _____ speed.
(5) _____ motor can be operate on both, AC as well as DC supply.
(6) A 4-pole induction motor operates at 50 Hz frequency. For 4% slip, speed of motor is equal to _____ rpm.
(7) Slip-rings are used with squirrel cage induction motor. **(True or False)**
(8) 3-phase induction motor is not self-starting. **(True or False)**
(9) Induction motor always runs at synchronous speed. **(True or False)**
(10) The slip of an induction generator is greater than one. **(True or False)**

Q-1 (b) A 3-phase, 5hp, 415 V, 50 Hz, 4-pole induction motor runs at 1460 rpm at full load. Calculate (i) synchronous speed (ii) slip at full load (iii) rotor current frequency at full load (iv) speed of motor at s=6% (v) synchronous speed at 25 Hz frequency (vi) speed of motor at f=25 Hz and s=4%. **06**

Q-2 (a) Explain No-load and Blocked rotor test of 3-phase induction motor **06**

Q-2 (b) Draw the circle diagram for a 3.73 KW, 200V, 50 Hz, 4-pole, 3-ϕ star connected induction motor from following test data: **10**

No-load Test : 200V, 5A, 350 W

Blocked rotor test : 100 V, 26 A, 1700 W

For full load condition, find out (i) full load current, (ii) power factor, (iii) slip and (iv) maximum torque.

OR

Q-2 (a) Develop equivalent circuit three-phase induction motor **06**

Q-2 (b) A 440 V, 3-ϕ, 50 Hz, 37.3 KW, Y-connected induction motor has the following parameters: **10**

$r_1 = 0.1\ \Omega$, $r_2' = 0.15\ \Omega$, $x_1 = 0.4\ \Omega$ and $x_2 = 0.44\ \Omega$

Motor has core loss of 1250 W and rotational loss of 1000 W. It draws a no-load line current of 20 A at power factor 0.09 (lag). When motor operates at a slip of 3%, calculate (i) input line current (ii) power factor (iii) developed torque (iv) output and (v) efficiency

Q-3 **Write short notes: (Any three)** **18**

(a) Universal motor

(b) Double cage squirrel cage induction motor

(c) Crawling and Cogging in induction motor

(d) Slip-torque characteristics of three-phase induction motor

(e) Magnetic levitation

Section - II

Q-4 (A) **Do as directed:** **(10)**

1 If the secondary of a T-T connected teaser transformer carries the current of 10 Amp, then primary of the teaser carries _____ Amp, if K is assumed to be unity.

2 In a Dd11 type of connection of a 3-$\varnothing$ transformer, '11' indicates the phase shift of _____ degree.

3 In a 3-$\varnothing$ core type transformer, core is built with _____ no. of legs (or limbs).

4 A 3-Φ, 50Hz, 6-pole induction motor runs at 900 rpm. The percentage slip of it is _____%.

5 In _____ type of induction motor, rotor consist of 3-Φ rotor winding connected in either star or delta.

6 The turns ratio of an 11000/110 Volt, star/star connected, 3-$\varnothing$ transformer is _____.

7 In a two winding transformer, HV winding is placed nearer to the core. (True or False)

8 In a 1-$\varnothing$ induction motor, the maximum starting torque is obtained when main winding current and starting winding current differ in time by 90 degree. (True or False)

9 The voltage regulation of a transformer should be as high as possible. (True or False)

10 In capacitor start-induction run 1-$\varnothing$ induction motor, the auxiliary winding and capacitor remain connected in the circuit at all times. (True or False)

(B) Draw the physical connection and phasor diagram of the following transformer connections. **(06)**
a) Yy0
b) Dz6

Q-5 **(A)** Explain the Scott connection for 3-∅ to 2-∅ conversion with neat diagram and calculation steps. **(08)**

(B) A 230V, 380 w, 4-pole, 50Hz single phase induction motor gave the following test results: **(08)**
No load test: 230 V, 2.8 A, 84 W

Blocked rotor test: 110 V, 6.2 A, 460 W
The stator winding resistance is 4.6 Ω and during the blocked rotor test, the auxiliary winding is open. Determine the equivalent circuit parameters.

OR

Q-5 **(A)** Explain the cross field theory for 1-∅ induction motor. **(08)**

(B) A 3-phase step down transformer is connected to 6.6 KV mains and takes 10 A. calculate the secondary line voltage, line current and output for following connections: **(08)**
(i) Y- Δ
(ii) Δ- Y
The ratio of turns per phase is 12. Neglect losses.

Q-6 **Attempt any three** **(18)**

(a) List the purposes for which the tertiary winding is employed as a third winding in addition to normal primary and secondary.

(b) Explain the V-V connection of 3-phase transformers with neat diagram and necessary calculations.

(c) Explain capacitor start-capacitor run 1-∅ induction motor.

(d) Explain the constructional details of a 3-∅ transformer with diagrams.

(e) State the conditions for parallel operation of 3-phase transformers.
