UNIVERSITY OF PUNE
[4363]-5
T. E. (ELECTRICAL) Examination 2013
ELETRICAL MACHINES-II
(2003 Pattern)

Total No. of Questions : 12   **[Total No. of Printed Pages :3]**
[Time : 3 Hours]   **[Max. Marks : 100]**
Instructions :

(1) *Answer Q. 1or Q.2 Q.3or 4,Q.5 or Q.6from Section-1*
(2) *Answer Q.7 or Q.8, Q.9 or Q.10, Q .11 or Q.12 from Section- ii*
(3) *Answers to the two Sections should be written in separate answer-books*
(4) *Neat diagrams must be drawn wherever necessary.*
(5) *Figures to right indicate full marks.*
(6) *Assume suitable data, if necessary.*

SECTION –I

Q1) A) Sketch the torque - slip characteristics of a 3 phase Induction motor   [10]
indicating there in the starting torque, maximum torque and the operating region.
How do starting and maximum torque vary with the rotor resistance?

B) Compare squirrel cage Induction motor and slip ring Induction motor   [8]

OR

Q2) A) Explain with neat sketches, how rotating magnetic field is   [10]
developed when 3 phase balanced supply is given to the stator windings of a 3 phase
induction motor. Give the frequency of such field and its magnitude.

B) The power input to the rotor of 400 V, 6-pole, 50Hz, 3- phase induction   [8]
motor is 20 kW. The Slip is 3% Calculate
1.The frequency of rotor current.
2.Rotor speed.
3.Rotor copper losses.
4. Rotor resistance per phase if rotor current is 60A.

Q3) A) Derive relationship between rotor input power, rotor copper loss   [8]
and power developed at shaft of a 3- phase induction motor.

B) The power input to rotor of a 500 V, 6- pole 3-phase   induction motor   [8]
running at 975 rpm 40k w. The stator copper losses are 1kW and friction & windage
losses total 2kW. Calculate
1.The slip.
2.Rotor copper losses.
3.Shaft power.
4.Efficiency.

OR

Q4)
A) Explain the procedure of no- load and blocked rotor tests on a 3-phase   [8]
induction motor, How are the parameters of equivalent circuit determined from test
result?

B)18.65 kW, 6- pole, 3-phase induction motor running at 960 rpm on full   [8]
load with rotor current per phase of 35 A. The mechanical losses are 1kW. Find the
rotor resistance per phase of 3-phase rotor winding.

Q5)
A) The resistance and reactance (equivalent) values of a double cage   [8]
induction motor for stator, outer and inner cage 0.25, 1.0 and 0.15 ohm resistance and
3.5, zero and 3.0 ohm reactance respectively. Find the starting torque if the phase
voltage is 250 V and the synchronous speed is 1000 rpm.

B) Explain with the help of diagram, construction and principle of operation   [8]
of a double cage induction motor. Draw its equivalentcircuit and torque speed
characteristics.

OR

Q6)
A)It is desired to install a 3-phase care induction motor restricting the maximum   [8]
line current drawn from a 400 V, 3 phase supply to 120 A. If the starting current is 6
times full load current, what is the maximum permissible full load k VA of the motor
when
1.   It is directly connected to the mains
2.   It is connected through an auto-transformer with a tapping of 60%

B) With the help of a neat diagram explain the operation of a direct on line   [8]
starter to start a 3 phase induction motor. Also derive the relation between starting
torque and full load torque in terms of starting current, full load current and slip at full
load.

SECTION-II

Q7) A) What are the various methods of braking of a 3-phase induction motor? [10]
Explain any one method with a circuit diagram.

B) Explain construction, principle of working of 3 phase induction voltage regulator.
What are its advantages over auto-transformer? [8]

OR

Q8) A) Explain the phenomena of cogging, crawling and noise production in a [10]
3-phase induction motor.

B) List various tests to be performed on 3-phase induction motor as per BIS. [8]

Q9) A) Using double-revolving field theory, explain why a single phase induction
motor is not self starting. [8]

B) Explain the working principle of i) Split phase, ii) Capacitor start single phase [8]
induction motor with the help of neat sketches.

OR

Q10) A) Draw the neat circuit diagram of a shade pole induction motor and [8]
explain its working. Also write application of shaded pole induction motor.

B) Discuss the procedure for determining the parameters of equivalent circuit of a [8]
single phase induction motor.

Q11) A) What problems are noticed when a D.C. series motor is connected [8]
across a A.C. supply of an equivalent voltage rating? How these are overcome?

B) With the help of suitable diagram explain how unidirectional torque is produced in
an A.C single phase series motor [8]

OR

Q12) A) What are compoles? Discuss various types of compoles commonly used [8]
in a A.C. Series motor.

B) Draw the circle diagram of a universal motor and indicate on it various performance
parameters of the motor. [8]