B.TECH SEM – V (2007 COURSE) (ELECTRICAL ENGG.) : SUMMER - 2018

SUBJECT: INDUCTION MACHINES THEORY AND DESIGN

Day: **Friday** Time: **10.00 AM TO 01.00 PM**
Date: **25/05/2018** Max Marks: 80

S-2018-2668

N.B:

1) **Q. No. 1** and **Q. No. 5** are **COMPULSORY.** Out of the remaining attempt **ANY TWO** questions from each section.
2) Figures to the **RIGHT** indicate full marks.
3) Draw neat labeled diagrams **WHEREVER** necessary.
4) Answers to both the sections should be written in **SEPARATE** answer books.
5) Use of non programmable calculator is **ALLOWED.**
6) Assume suitable data, if necessary.

SECTION-I

Q.1 **a)** Discuss induction motor as a generalized transformer. **(05)**

b) Discuss briefly the various methods of speed control of 3-phase induction motor. **(05)**

c) Discuss why single phase induction motor does not have a starting torque. **(04)**

Q. 2 **a)** Describe with neat sketches the construction of a 3-phase cage type I. M. **(06)**

b) A 4-pole, 3-phase I. M. operate from a supply whose frequency is 50 Hz. **(07)**

Calculate:

i) the speed at which the magnetic field of the stator is rotating.
ii) the speed of the rotor when the slip is 0.04.
iii) the frequency of the rotor current when the slip is 0.03
iv) the frequency of the rotor current at standstill.

Q. 3 **a)** Describe the no-load & blocked rotor test on 3-phase induction motor. **(07)**

b) Discuss the working of Induction generator. Mention its advantages & disadvantages. **(06)**

Q. 4 **a)** Discuss how to make a single phase induction motor self starting. **(07)**

b) Describe the construction, working of a capacitor-start single phase induction motor. Where this type of motor is commonly used. **(06)**

SECTION-II

Q. 5 **a)** Discuss the factors which affect the choice of specific magnetic loading for a 3-phase I. M. **(05)**

b) Discuss various factors considered in selection of length of air gap in 3-pase I.M. **(05)**

c) Compare relative size of 3-phase & 1-phase induction motor considering the same output. **(04)**

P. T. O.

Q. 6 **a)** Determine main dimensions for a 15 kW, 415 V, 3-phase , 4-pole, 1480 rpm, delta connected induction motor using following data: SML = 0.45 wb/m^2, SEL = 34000 A/m, Full load efficiency = 0.85, Full load power factor = 0.84. Assume good overall design. **(07)**

b) Derive output equation for a 3 phase induction motor. **(06)**

Q. 7 **a)** An 11.2 kW, 415 volts, 3-phase, 6-pole, 50 Hz star connected squirrel cage induction motor has following data : Number of stator slots = 54, no. of rotor slots = 63, number of conductors per slot = 16, full load efficiency = 0.89, full load power factor = 0.92, δ_b = 6 A/mm^2, δ_e = 7 A/mm^2. Calculate the bar current & end ring current, cross section of each bar and each end ring. **(07)**

b) What is Dispersion Coefficient? Explain its use in design. **(06)**

Q. 8 **a)** Determine the main dimensions of a 4 HP, 230 V, 50 Hz, 4 pole, single phase induction motor using following data: B = 0.44 wb/m^2, ac = 10000 A/m, Cos Φ = 0.65 lag, full load efficiency = 69%. Assume square pole construction. **(07)**

b) Discuss the factors which affect the choice of specific magnetic loadings for single phase induction motor. **(06)**

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