Tutorial Sheet 6

1. A two-pole, star-connected, three phase induction motor exhibits no saliency and is connected to a 415V(rms line to line voltage) 50Hz three-phase mains supply. The total machine iron loss is 560W, which can reasonably be assumed not to vary significantly with speed or load. The motor has the following per-phase equivalent circuit parameters:

Stator resistance= 0.16Ω

Stator leakage reactance = 0.26 Ω

Referred rotor leakage reactance = 0.24Ω

Magnetising reactance = 50Ω

a) Calculate the motor input current when operating on no-load.

b) When driving a load, the motor operates at a slip of 0.05 producing a torque of 100 Nm. The magnitude of the input current at this operating point is 45A. Calculate the following:

i) Referred rotor resistance

ii) The efficiency at this operating point

c) The load is reduced such that the motor speeds up to 2920 rpm. Using the per phase equivalent circuit for the induction motor, calculate the following:

i) Phase current drawn

ii) Power factor of the motor at this operating condition

iii) The torque produced by the motor at this operating point

iv) The efficiency at this operating point