

THE UNIVERSITY OF SHEFFIELD  
DEPARTMENT OF ELECTRONIC AND ELECTRICAL ENGINEERING

Generalised Machine Theory  
Example Sheet No. 1

1. A universal series motor has a resistance of  $35\Omega$  and an inductance of  $0.6H$ . When connected to a  $230V$  dc supply and with a given load it takes a current of  $0.6A$  and runs at  $2000rpm$ . Estimate its speed and power factor when connected to a  $200V$ ,  $50Hz$  supply and producing the same torque.

What is the ratio of the starting torques in the two cases?

{  $1380rpm$ ,  $0.825lag$ ,  $1/39.6$  }

2. A universal motor has a resistance of  $50\Omega$  and an inductance of  $0.7H$ . When connected to a  $240V$ ,  $50Hz$  supply and supplying a certain torque the motor takes a current of  $0.6A$ , and runs at a speed of  $1500rpm$ . Estimate the speed and current when the supply is changed to  $230V$  dc the load torque remaining the same.

{  $0.6A$ ,  $1760rpm$  }

3. A  $200V$ ,  $25Hz$ , 4-pole single-phase series motor has the following effective parameters :-

$$R_f = R_a = 0.5\Omega \quad L_f = 0.012H, \quad L_a = 0.008H, \quad M = 0.009H.$$

Determine the speed, output and power factor if the machine supplies a gross torque of  $40N-m$ .

{  $983rpm$ ,  $5.51hp$ ,  $0.672lag$  }