Short answers for 4B19 Renewable Electrical Power 2010 Dr T J Flack

1. (a) Total annual energy output = 5181 MWhr, capacity factor = 0.37
(c) Total annual energy output = 6205 MWhr, capacity factor = 0.283.
(d) For proposal (a) cost of electricity is 3.1p/kWhr, for (b) it is 4.1p/kWhr.

2 (b) (i) Voltage is 12.83 kV, angle is 19.6^0 (ii) Voltage is 10.82 kV, angle is 23.4^0.(c) C = 33μF.

3 (b) Angular speeds are 50 $rads^{-1}$ and 150 $rads^{-1}$; voltages are 60 V and 180 V; frequencies are 31.8 Hz and 95.5 Hz; powers are 72.5 W and 1.96 kW. (c) DC link voltages are 81 V and 243 V; currents are 0.895 A and 8.06 A. (d) At the lower wind speed m_A=1 and ρ=0.523. At higher wind speed ρ=0 and m_A = 0.7.

4 (c) (i) Minimum power = 59.2 MW, maximum power = 2958 MW.(ii) Power rating = 1.2 MW. (iii) Peak velocity = 1.3 ms^{-1}. Peak thrust = 1.83 MN.