Problem Set - 1
Basics of Power Systems

1. A generating station has a maximum demand of 25 MW, a load factor of 60 %, a plant capacity factor of 50 % and a plant use factor of 72 %. Find the following.

   (a) The daily energy produced, (**Ans: 360 MWh**)

   (b) The reserve capacity, (It is the difference between the installed capacity and the maximum demand.) (**Ans: 5 MW**)

   (c) The maximum energy that could be produced daily.(**Ans: 500 MWh/day**)

2. From a load duration curve, the following data is obtained.

   - The maximum demand on the system is 20 MW.
   - The load supplied by the two units is 14 MW and 10 MW.
   - Unit 1 (base unit) works for 100 % of time, and Unit 2 (peak load unit) only for 45 % of the time.
   - The energy generated by Unit 1 is 1×10^8 units and that by Unit 2 is 7.5×10^6 units.

   Find the following.

   (a) The plant capacity factor of Units 1 and 2, (**Ans: 81.54 %, 8.56 %**)

   (b) The plant use factor of Units 1 and 2, (**Ans: 81.54 %, 19.02 %**)

   (c) The load factor of the plant. (**Ans: 61.35 %**)

3. A three phase load draws 250 kW at a power factor of 0.707 lagging from a 440 V supply. In parallel with this load is a three-phase capacitor bank which draws 60 kVA. Find the total current and resultant power factor. (**Ans: 412 A, 0.796 lag**)

4. A purely resistive balanced-Δ connected load of 18 Ω per phase is in parallel with a purely resisitve balanced Y connected load of 12 Ω per phase. The combination is connected to a three phase balanced supply of 400 V rms (line to line) via a three phase line having an impedance of $(1 + \jmath 3)$ Ω per phase. Determine

   (a) the current, (**Ans:** $39.61\angle -30.96^\circ$ **A**)

   (b) the real and reactive power drawn from the supply. (**Ans: 23.53 kW, 14.12 kVAr**)