

**Q (1).** A power system has 300 MW rated capacity is supplying two consumers having the following data :

	LDC	$D_{\max}(\text{MW})$	DF (pu)
Consumer A	$D(t) = 1 - 0.4t$	100	0.5
Consumer B	$D(t) = 1 - 0.6t$	60	0.4

- Calculate :
- (a) connected load for each consumer.
  - (b) average load for each consumer.
  - (c) annual energy consumption.
  - (d) system max demand for diversity factor of 1.2
  - (e) system load factor.

**Q (2).** The annual output of a power plant is  $600 \times 10^3$  MWh. The annual LF is 0.7 and the UF is 0.8. If the annual FCR is 100 SR/kW of the installed capacity and the cost of fuel is .04 SR/kWh and the total cost of annual O&M is  $20 \times 10^3$  SR, calculate :

- a) the reserve capacity.
- b) the annual fixed charges.
- c) the cost of energy to consumers if the company is allowed to make 15% profit.

**Q (3).** The annual maximum demand for an industrial consumer is 150 MW and the LF is 80%. As a system planner, you may consider one of the following plans :

- (a) either to buy the required energy from the electric company at a cost of 7 H/kWh, or
- (b) to install a power plant of 200 MW rated capacity with the following data :

$$\begin{aligned} \text{I/O curve (I)} &= 100 + 4L + 0.003 L^3 \text{ MBTU/h} \\ \text{capital cost} &= 1500 \text{ SR/kW} \\ \text{fixed charge rate} &= 10\% \\ \text{cost of fuel} &= 5 \text{ SR/MBTU} \\ \text{O\&M} &= 13 \text{ MSR/year} \end{aligned}$$

- (c) in (b) what is the load at which maximum efficiency will occur?.
- (d) in (b) what is the increase in the input for an increase in the output from 50 to 80 MW.

Q (4)

The forecasted annual maximum load ( $L_{\max}$ ), for a small city is 100 MW, and the LDC can be represented by the following equation as:

$$L(t) = (1 - t) L_{\max} \quad 0 \leq t \leq 1$$

The following generating units are planned to be installed in a power plant (PP) to meet that forecasted load.

2x50 MW (FOR = 0.01)

1x60 MW (FOR = 0.04)

Evaluate the annual **LOLE** and the **εENS** for the system.

Q (5). A circuit consists of 5 transistors each with  $\lambda=10^{-6}$  f/h, 3 diodes each with  $\lambda=0.6 \times 10^{-6}$  f/h, 4 capacitors each with  $\lambda=0.5 \times 10^{-6}$  f/h, 10 resistors each with  $\lambda=8 \times 10^{-6}$  f/h and 3 switches each with  $\lambda=3 \times 10^{-6}$  f/h. Evaluate the followings:

(a) the equivalent failure rate if all components must work for system success.

(b) the equivalent failure rate if another circuit is connected in parallel and only one circuit is required for system success.