



Kafrelsheikh University	 	4 th Year Mech. Power
Faculty of Engineering		Final Exam – Jan., 2016
Mech. Power Engineering Dept.		Time: 3 Hrs.
Thermal Power Stations (2)		
• Assume any missing data.		

الإمتحان ورقة واحدة وجهان

Question (1)

- a. "The daily load curves have attained a great importance in power generation" Justify this statement and explain the supplied information by daily load curves.
- b. Define the following terms with reference to power generation systems:
 - i) Connected load
 - ii) Load factor
 - iii) Diversity factor
 - iv) Plant capacity factor
- c. What are the advantages of connection of several generating stations in parallel?
- d. The annual load duration curve for a typical heavy load being served by a steam station, a run-of-river station and a reservoir hydro-electric station is as shown in **Figure (Q1.d)**. The ratio of number of units supplied by these stations is as follows :
 Steam : Run-of-river : Reservoir :: 7 : 4 : 1
 The run-of-river station is capable of generating power continuously and works as a base load station. The reservoir station works as a peak load station.
 Determine (i) the maximum demand of each station and (ii) load factor of each station.

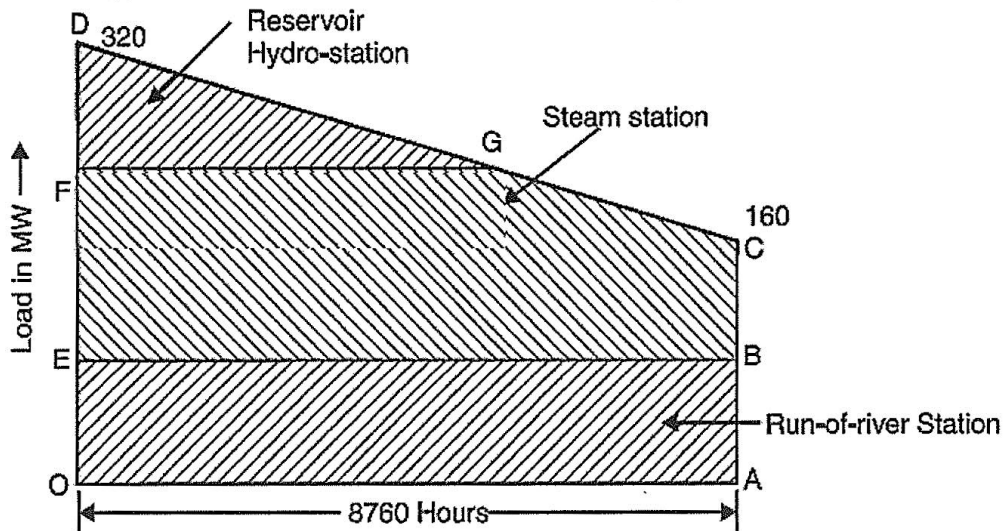


Fig. Q1.d

Question (2)

- a. "The load factor plays a vital role in determining the cost of energy" Justify this statement and explain the important advantages of high load factor.
- b. Discuss the various methods of determining the depreciation of the equipment.
- c. A load having a peak value of 50 MW and 45% load factor is to be supplied by a steam power station in conjunction with a hydro-power station, the latter supplying 60 million units

of energy per annum with a maximum output of 20 MW. Calculate the average cost of energy.

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|-------------------------------|--|
| i. Capital cost | <i>Steam</i> : 2000 \$ per kW installed
<i>Hydro</i> : 3000 \$ per kW installed |
| ii. Cost of fuel | Coal 150 \$ per metric ton ; consumption being 0.5 kg per unit generated |
| iii. Maintenance charges | <i>Steam</i> : 0.7 ¢ per unit
<i>Hydro</i> : 0.5 ¢ per unit |
| iv. Interest and depreciation | <i>Steam</i> : 10% per annum
<i>Hydro</i> : 9% per annum |

Question (3)

- a. Discuss the various factors of **environmental impacts** to be considered while selecting the site for thermal power station.
- b. Discuss the flow chart of the siting activities/tasks.
- c. What are the types of combined gas turbine and steam cycles with neat sketch?
- d. What are the advantages and limitations of artificial and natural draught?
- e. Explain the functions of following components of a thermal power plant:
 - i. Superheater
 - ii. Reheater
 - iii. Feed water heater
 - iv. Economizer
 - v. Air Preheater
 - vi. Deaerator
- f. Determine height and diameter of chimney to produce static draught of 18 mm of water column if mean flue gas temperature and flow rate are 300 °C and 2100 kg/min respectively, atmospheric air temperature is 25 °C. the gas constant for air 287 kJ/kg.K. and for flue gas 250 kJ/kg.K. Assume no loss of draught in chimney and barometer reading is 76 mm of mercury.

Good Luck