R16

Code No:134BX

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, 2019
POWER SYSTEMS – I

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit.

Part A (25 marks)		
Q.No	**Question**	**Bloom's Level**
1.a	Why is electrical energy preferred over other forms of energy?	L1
b	Mechanical energy is supplied to a d.c. generator at the rate of 4200 J/s. Thegenerator delivers 32·2 A at 120 V. (i) What is the percentage efficiency of the generator (ii) How much energy is lost per minute of operation?	L2
c	List the merits and demerits of a hydro-electric plant.	L1
d	Explain the essential factors which influence the choice of site for a hydro-electric plant.	L1
e	What are the advantages of high transmission voltage?	L1
f	Draw a single line diagram of a typical a.c power supplyscheme.	L2
g	What is a sub-station?	L1
h	Why are pole-mounted sub-stations very popular?	L2
i	What are the desirable characteristics of a tariff?	L1
j	The following two tariffs are offered : (a) Rs 100 plus 15 paise per unit ; (b) A flat rate of 30 paise per unit ; At what consumption is first tariff economical?	L2
	Part B (Marks 50)	
2	a) What is a power generating station? b) A thermal station has the following data: Max. demand = 20,000 kW ; Load factor = 40%Boiler efficiency = 85% ; Turbine efficiency = 90%Coal consumption = 0·9 kg/kWh ; Cost of 1 ton of coal = Rs. 300Determine (i) thermal efficiency and (ii) coal bill per annum.	L3
	OR	
3	Draw the schematic diagram of a modern steam power station and explain its operation.	L2
4	a) Why hydro-electric stations have high transmission and distribution costs? b) A hydro-electric generating station is supplied from a reservoir of capacity $5x10^6$ cubic metres at a head of 200 metres. Find the total energy available in kWh if the overallefficiency is 75%.	L3
	OR	
5	Calculate the average power in kW that can be generated in a hydro-electric project from the following data Catchment area = $5\times10^9 m^2$; Mean head, H = 30 m, Annual rainfall, F = 1·25 m; Yield factor, K = 80 %, Overall efficiency, $\eta_{overall}$ = 70 %If the load factor is 40%, what is the	L4

	rating of generators installed?	
6	A d.c. 3-wire system is to be converted into a 3-phase, 4-wire system by adding afourth wire equal in X-section to each outer of the d.c. system. If the percentage power loss andvoltage at the consumer's terminals are to be the same in the two cases, find the extra power at unitypower factor that can be supplied by the a.c. system. Assume loads to be balanced.	L4
	OR	
7	Compare the volume of conductor material required for a d.c. 3-wire system and 3-phase, 3-wiresystem on the basis of equal maximum potential difference between one conductor and earth. Makesuitable assumptions.	L3
8	With the aid of schematic give the comparison of outdoor and indoor sub-stations.	L2
	OR	
9	What is a transformer sub-station? What are the different types of transformer sub-stations? Illustrate with a suitable block diagram.	L2
10.a)	What do you understand by (*i*) base load and (*ii*) peak load of a power station. Identify suitable generating stations under each category.	L2
b)	An electric supply company having a maximum load of 50 MW generates 18×10^7 units per annum and the supply consumers have an aggregate demand of 75 MW. Theannual expenses including capital charges are : For fuel = Rs 90 lakhs, Fixed charges concerning generation = Rs 28 lakhs, Fixed charges concerning transmission and distribution = Rs 32 lakhs, Assuming 90% of the fuel cost is essential to running charges and the loss in transmission anddistribution as 15% of kWh generated, deduce a two part tariff to find the actual cost of supply to theconsumers.	L4
	OR	
11.a)	Write short notes on the following : (*i*) Two-part tariff. (*ii*) Power factor tariff. (iii)Three-part tariff.	L2
b)	A base load station having a capacity of 18 MW and a standby station having acapacity of 20 MW share a common load. Find the annual load factors and plant capacity factors oftwo power stations from the following data: Annual standby station output = $7{\cdot}35\times10^6$ kWh Annual base load station output = $101{\cdot}35\times10^6$ kWh Peak load on standby station = 12 MW Hours of use by standby station/year = 2190 hours	L3