

**DHANALAKSHMI SRINIVASAN COLLEGE OF
ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING**

QUESTION BANK

III SEMESTER

ME8792 POWER PLANT ENGINEERING

Regulation – 2017

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QUESTION BANK

SUBJECT : ME8792- POWER PLANT ENGINEERING

SEM / YEAR: III/II

<u>UNIT I - COAL BASED THERMAL POWER PLANTS</u>				
Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.				
PART – A				
Q.No	Questions		BT Level	Competence
1.	Describe the processes of Rankine Cycle.		BTL 1	Remember
2.	Design the layout of coal based thermal power plant.		BTL 6	Create
3.	Define steam rate and heat rate.		BTL 1	Remember
4.	Analyze thermal power plants are not suitable for supplying fluctuating loads.		BTL 4	Analyze
5.	Illustrate the function boiler and turbine.		BTL 3	Apply
6.	Define superheated steam.		BTL 1	Remember
7.	Describe super critical boilers.		BTL 2	Understand
8.	Define the merits of pulverized fuel firing system.		BTL 1	Remember
9.	Describe stoker and classify it.		BTL 1	Remember
10.	Generalize the necessity of feed pump in thermal power plant.		BTL 6	Create
11.	Compare the various modern ash handling systems.		BTL 4	Analyze
12.	List the methods used for handling of coal.		BTL 1	Remember
13.	Summarize the function of cooling tower.		BTL 2	Understand
14.	Discuss the requirements of a modern surface condenser.		BTL 2	Understand
15.	Explain the term boiler draught.		BTL 5	Evaluate

16.	Explain pulveriser and why it is used.		BTL 5	Evaluate
17.	Express the factors affecting cooling of water in cooling tower.		BTL 2	Understand
18.	Why majority of coal based thermal power plants are located near Seashore?		BTL 4	Analyze
19.	Demonstrate a neat sketch of basic principle of FBC.		BTL 3	Apply
20.	Reason out why cogeneration is quite viable in sugar industries compare to that in other industries.		BTL 4	Analyze
PART – B				
1.	Describe the following subsystems of thermal power plant (i) Fuel handling system (ii) Ash handling system	(6) (7)	BTL1	Remember
2.	(i) Explain any one type of cooling tower with neat sketch (ii) Describe with the help of a neat sketch working of induced draught cooling tower	(7) (6)	BTL5	Evaluate
3.	Draw a general layout of steam power plant with neat diagram and Explain the working of different circuits.	(13)	BTL4	Analyze
4.	Explain the following with neat diagram: (i) Benson boiler (ii) Any one type of cogeneration power plant	(7) (6)	BTL4	Analyze
5.	i) Describe the working of FBC boiler with a neat diagram. ii) Super critical Boiler.	(6) (7)	BTL1	Remember
6.	i) Discuss the functions of air heater types. ii) Describe with a sketch the working of a mercury-water binary cycle.	(7) (6)	BTL2	Understand
7.	Write the shorts notes on : i) Ash handling system. ii) Different draught systems.	(6) (7)	BTL1	Remember
8.	Explain with a neat sketch the working of a thermal electric power plant station and discuss the function of major components in it.	(13)	BTL5	Evaluate
9.	Design an explanatory line diagram of an ash handling system employed in steam power plants and also explains the difficulties encountered in the handling of ash in a thermal power station.	(13)	BTL6	Create

10.	Demonstrate the power plant performance and its efficiency and explain about pulverized coal system.	(13)	BTL3	Apply	
11.	Explain the water tube boiler and fire tube boiler with neat sketch.	(13)	BTL4	Analyze	
12.	Illustrate the principle involved in preparation of coal and what are the methods of preparation?	(13)	BTL3	Apply	
13.	Discuss the different types of cooling towers? Explain with a neat sketch.	(13)	BTL2	Understand	
14.	Examine the reheat system and regeneration system of a thermal power plant.	(13)	BTL1	Remember	
PART – C					
1.	Sketch and Explain the construction and operation of super critical boiler.	(15)	BTL 5	Evaluate	
2.	Draw a line diagram of fluidized bed combustion system where the steam turbine is used as a prime mover and explain its working.	(15)	BTL5	Evaluate	
3.	Why is coal pulverised? Explain any one type of pulverized systems used now a days.	(15)	BTL 5	Evaluate	
4.	The Following data refer to a simple steam power plant.				
	No.	Location	Pressure bar	Quality/Temp°C	Velocity m/s
	1	Turbine Inlet	60	380	-
	2	Condenser Inlet	0.1	0.90	200
Calculate					
<ul style="list-style-type: none"> • Power Output of the turbine. • Heat transfer rate in Boiler and Condenser. • Quantity of cooling water Circulated. 					
UNIT II - DIESEL, GAS TURBINE AND COMBINED CYCLE POWER					
Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.					
PART – A					
Q.No	Questions		BT	Competence	
1.	List the applications of diesel engine power plant.		BTL1	Remember	
2.	Design the layout of Diesel power plant.		BTL6	Create	
3.	Justify: Auxiliary Power consumption of Brayton Cycle is almost twice that of Rankine Cycle despite the thermodynamic Processes adopted are similar		BTL4	Analyze	
4.	Examine the commonly used fuel injection System in a diesel power station.		BTL3	Apply	
5.	Explain the processes of Otto cycle.		BTL5	Evaluate	

6.	Discuss the processes of dual cycle.		BTL2	Understand
7.	Name the various gas power cycle.		BTL1	Remember
8.	Tell the different types of Engines used in diesel power plants.		BTL1	Remember
9.	Summarize the processes of diesel cycle.		BTL5	Evaluate
10.	Prepare the list of the various processes of Brayton cycle.		BTL6	Create
11.	Classify the various types of cooling system used in diesel power plant.		BTL4	Analyze
12.	Tell any two drawbacks of a stationary gas turbine power plant for generation of electricity.		BTL1	Remember
13.	Name the components of Gas Turbine power plants.		BTL1	Remember
14.	Point out the major difference between Otto cycle and Diesel cycle.		BTL4	Analyze
15.	Describe the effect of inter cooling in a gas turbine plant.		BTL1	Remember
16.	Give the advantages and disadvantages of a diesel power plant.		BTL2	Understand
17.	Demonstrate the process in combined cycle power plant.		BTL3	Apply
18.	Express the advantages of combined cycle power plants.		BTL2	Understand
19.	State the significance of load factor and capacity factor of a Gas Based power plant.		BTL2	Understand
20.	Illustrate the advantages of Integrated Gasifier based combined cycle power plants.		BTL3	Apply
PART – B				
1.	List the type of gas turbine power plant and explain in detail with neat diagram.	(13)	BTL5	Evaluate
2.	Examine the Otto cycle and processes with p-V and T-S diagrams.	(13)	BTL3	Apply
3.	Explain the essential components of the diesel power plant with neat diagram.	(13)	BTL4	Analyze
4.	(i) Derive an expression for the work ratio using Brayton cycle ii) Draw and explain PV and TS diagrams of Brayton cycle.	(7)	BTL2	Understand
		(6)		
5.	(i) Express the advantages and disadvantages of a diesel power plant over a gas turbine power plant. (ii) Give a maintenance schedule for Diesel engine power plant.	(7)	BTL2	Understand
		(6)		

6.	(i) Bring out the difference between closed cycle and open cycle gas turbine power plants. (ii) Discuss why combined cycle power generation is so important in present day energy scenario.	(7) (6)	BTL2	Understand
7.	Explain the working of open cycle and closed cycle Gas turbine power plant and discuss its advantages and disadvantages.	(13)	BTL4	Analyze
8.	Design and explain the layout of a Combined Cycle Power Plant.	(13)	BTL6	Create
9.	i) Distinguish between closed cycle and open cycle gas turbine power plants. ii) Discuss why combined cycle power generation is so important in present day energy scenario.	(7) (6)	BTL2	Understand
10.	Explain the layout of an Integrated Gasifier based Combined Cycle Power Plant.	(13)	BTL4	Analyze
11.	(i) Describe the classification of gas turbine power plants. (ii) Tell the advantages and disadvantages of open cycle gas turbine power plant.	(7) (6)	BTL1	Remember
12.	i) Explain in detail about the construction and working of IGCC. ii) Discuss the working of anyone type of combined cycle power plant.	(7) (6)	BTL5	Evaluate
13.	Discuss the working of a modern gas turbine power plant of capacity, say 30 MW with an illustration	(13)	BTL2	Understand
14.	Explain in detail about the construction and working of Integrated Gasifier based Combined cycle system(IGCC)	(13)	BTL5	Evaluate
PART – C				
1.	Identify p-v & t-s diagram, explain the effect of intercooling, reheating& regeneration in a gas turbine plant.	(15)	BTL5	Evaluate
2.	Show that the efficiency of the Diesel cycle is always lower than the efficiency of Otto cycle for the same compression ratio.	(15)	BTL5	Evaluate
3.	Draw the theoretical and actual p-V diagram of a four stroke Otto cycle engine and Explain the reason for derivations.	(15)	BTL6	Create
4.	State the purpose of heating, regeneration and intercooling in gas turbine powerplants	(15)	BTL5	Evaluate

UNIT III - NUCLEAR POWER PLANTS				
Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : <i>Boiling Water Reactor (BWR)</i> , <i>Pressurized Water Reactor (PWR)</i> , CANada Deuterium- Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.				
PART – A				
Q.No	Questions		BT	Competence
1.	Describe the advantages of nuclear power plant.		BTL2	Understand
2.	Name the three moderators used in nuclear power plants.		BTL1	Remember
3.	Explain the function of nuclear reactor.		BTL5	Evaluate
4.	List the function of control rods with example.		BTL1	Remember
5.	Define electron volt with reference to nuclear power plant.		BTL2	Understand
6.	Generalize the fuels used in nuclear power plants.		BTL6	Create
7.	Demonstrate the conditions satisfied to sustain nuclear fission process.		BTL3	Apply
8.	List down the basic factors those are to be considered for the design of a nuclear power reactor.		BTL1	Remember
9.	Point out the advantages of fast breeder reactors.		BTL4	Analyze
10.	Define ‘CANDU’ reactor.		BTL1	Remember
11.	Explain the requirements of fission process.		BTL4	Analyze
12.	Examine “half life” of nuclear fuels?		BTL2	Understand
13.	Explain the functions of moderators.		BTL4	Analyze
14.	Distinguish between PHWR and LMFBR.		BTL2	Understand
15.	Define the term “Breeding”.		BTL1	Remember
16.	Name the components of pressurized water reactor nuclear power plant.		BTL1	Remember
17.	Classify the nuclear reactors.		BTL3	Apply

18.	Integrate to provide for safety of nuclear power plant.		BTL6	Create
19.	Illustrate the various types of fast breeders.		BTL3	Apply
20.	Assess the components of supercritical water reactor nuclear power plant.		BTL5	Evaluate

PART – B				
1.	Explain with neat diagram various components of nuclear reactor with layout of power plant.	(13)	BTL4	Analyze
2.	i) With neat diagram explain boiler water reactor. Also mention its advantages and disadvantages. ii) Explain nuclear fission and chain reaction.	(7) (6)	BTL5	Evaluate
3.	Describe the working of a typical fast breeder nuclear reactor power plant, with neat diagram.	(13)	BTL1	Remember
4.	Demonstrate the difference between a pressurized water reactor nuclear power plant and boiling water reactor nuclear power plant.	(13)	BTL3	Apply
5.	Explain the difference between controlled and uncontrolled nuclear chain reaction.	(13)	BTL4	Analyze
6.	With the help of a sketch show all the important part of nuclear reactor. Describe briefly the functions of each part.	(13)	BTL2	Understand
7.	i) Discuss the advantages and disadvantages of breeder reactor. ii) Summarize fission of nuclear fuel. iii) Discuss radiation hazards and shielding.	(7) (6)	BTL2	Understand
8.	Compare the working merits and demerits of PWR and BWR.	(13)	BTL5	Evaluate
9.	Generalize in detailed notes on following: (i) Boiling water reactor (ii) Gas cooled reactor.	(7) (6)	BTL6	Create
10.	i) Describe the importance of nuclear waste management. ii) Examine the safety measures for nuclear power plants.	(7) (6)	BTL1	Remember

11.	i) List and brief the characteristics features of a BWR. ii) Describe the India's three stage nuclear power programme.	(7) (6)	BTL1	Remember
12.	Show the expression of the radioactivity decay rate.	(13)	BTL3	Apply
13.	i) Explain the Gas Cooled and Liquid Metal Cooled Reactors. ii) Explain the CANADA Deuterium- Uranium reactor (CANDU).	(7) (6)	BTL4	Analyze
14.	Discuss the following terms: (i) Fission of nuclear fuel (ii) Distribution of fission energy (iii) The chain reaction.	(13)	BTL6	Create
PART – C				
1.	i) What is CANDU Type Reactor? Explain with a neat sketch its main features. ii) Name the four reactions involving Deuterium in a fusion reactor. Which one is achieved quite early?	7 8	BTL5	Evaluate
2.	(i) Explain the function of reflectors and cladding. (ii) Write a note on India's three stage nuclear power programme.	7 8	BTL5	Evaluate
3.	Draw the diagram of PWR and BWR and explain the advantages and disadvantages. What are the conditions which prefer PWR and BWR and vice- versa.	15	BTL5	Evaluate
4.	Write about principles of nuclear energy. List out the various power plants station in India. With neat sketch explain any one.	15	BTL6	Create

UNIT -4 POWER FROM RENEWABLE ENERGY				
Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, <i>Solar</i> Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems				
PART – A				
Q.No	Questions		BT	Competence
1.	Demonstrate the tall tower essential for mounting a horizontal axis wind turbine		BTL 3	Apply
2.	Discuss the binding energy		BTL 2	Understand
3.	Illustrate the advantages and disadvantages of hydropower plants		BTL 3	Apply
4.	Define the function of surge tank in hydro plants.		BTL 1	Remember
5.	Define Tidal range(R).		BTL 2	Understand
6.	Classify the hydro electric turbines with respect to high medium and low head.		BTL 4	Analyze
7.	Analyze the three main factors of power output of hydroelectric plant.		BTL 4	Analyze
8.	Give the main parts of pelton wheel.		BTL 2	Understand
9.	Demonstrate the function of spear & nozzle.		BTL 3	Apply
10.	Describe water hammer.		BTL 1	Remember
11.	Discuss the essential factor which should be considered while selecting a site for a hydro electric power plant.		BTL 2	Understand
12.	Name the basis of classification of turbines.		BTL 1	Remember
13.	List the difference between Francis and Kaplan Turbine.		BTL 5	Evaluate
14.	Compose the limitations of tidal power plant.		BTL 6	Create
15.	List the components of Tidal power plants.		BTL 1	Remember
16.	Explain fuel cell and state its advantages.		BTL 4	Analyze
17.	Summarize the geothermal energy.		BTL 5	Evaluate
18.	Quote the applications of geothermal energy		BTL 1	Remember

19.	Generalize the important criteria while selecting the geothermal energy		BTL 6	Create
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20.	Name two type of Geothermal energy deposits.		BTL 1	Remember
PART – B				
1.	i) Draw a schematic diagram of a hydro plant and explain the operation. ii) Write short note on Bio energy.	(7)	BTL 1	Remember
		(6)	BTL 1	
2.	(i) Compare Kaplan turbine and Francis turbine. (ii) Explain pumped storage power plant with its merits & demerits.	(7)	BTL 1	Remember
		(6)	BTL 1	
3.	With neat diagram explain the working of biogas plant and solar photovoltaic system with advantages and disadvantages.	(13)	BTL 2	Understand
4.	Describe the detail about surge tank used in hydro electric power plant. Also explain about the classification and selection of dams.	(13)	BTL 1	Remember
5.	(i) Examine the factors to be considered while selecting the site of a hydro power plant. (ii) Illustrate the pumped storage plant .Explain with a sketch.	(7)	BTL 3	Apply
		(6)		
6.	Classify the turbines. Explain anyone with a suitable sketch	(13)	BTL 3	Apply

7.	Explain the selection factors of a hydraulic turbine .What are the function of a hydraulic turbine?	(13)	BTL 4	Analyze
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8.	i) Describe the functions of a solar PV electric plant. ii) Quote the advantages of fuel cell power sources with specific reference to environment.	(6) (7)	BTL 1	Remember
9.	Generalize the construction and working of Geo thermal power plant	(13)	BTL 6	Create
10.	(i) Give the different types of Tidal power plants. (ii) Describe Solar thermal central receiver system	(7) (6)	BTL 2	Understand
11.	Discuss the different types of ocean thermal energy conversion system	(13)	BTL 2	Understand
12.	Describe the advantages and limitations of MHD power plant	(13)	BTL 3	Apply
13.	“Solar Thermal power cycle can be broadly classified into Low, Medium and High temperature cycles” .Elaborate this statement with suitable example and relevant sketches.	(13)	BTL 4	Analyze
14.	(i) Explain with a neat diagram of wind electric generating power plant. (ii) Explain in detail about the various types of Wind energy system	(7) (6)	BTL 5	Create
PART – C				
1.	i) List out the essential elements of hydro Power plant and Explain with a neat sketch (10) ii) Describe the working of low head Hydro Plant with a neat diagram.	(7) (8)	BTL 5	Evaluate

2.	Draw a Schematic diagram of a solar power plant and explain the operation of it. Also mention its merits and demerits	(15)	BTL 5	Evaluate
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3.	Explain with a neat sketch working of a Distributed (parabolic) through solar power plant	(15)	BTL 6	Create
4.	i) Explain the various type of prime movers used in geo-thermal energy conversion system ii) Describe the principle of a fuel cell and discuss the choice of fuel required	(8) (7)	BTL 6	Create
UNIT-5 ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS				
Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.				
PART-A				
Q.No	Questions		BT	Competence
1.	Define demand factor.		BTL 1	Remember
2.	Define load factor and capacity factor.		BTL 1	Remember
3.	Illustrate the significance of load curve.		BTL 3	Apply
4.	Show the load duration curve.		BTL 3	Apply
5.	Discuss about tariff.		BTL 2	Understand
6.	Calculate the cost of electricity.		BTL 3	Apply
7.	Express the two part tariff.		BTL 2	Understand
8.	How to improve the power factor.		BTL 2	Understand
9.	Describe the fixed costs in a power plant.		BTL 1	Remember
10.	Explain financing cost.		BTL 4	Analyze
11.	Discuss about operating cost.		BTL 2	Understand
12.	Describe depreciation.		BTL 1	Remember
13.	Explain the various operating cost of coal fired steam power plant.		BTL 5	Evaluate
14.	Integrate the potential options for CO ₂ Sequestration.		BTL 6	Create

15.	Explain the waste disposal options for Coal Power Plant		BTL 4	Analyze
16.	List the components of fixed cost.		BTL 1	Remember
17.	Describe the significance of two part tariff and three part tariff.		BTL 1	Remember
18.	Explain the criteria for site selection of power plant.		BTL 4	Analyze
19.	Generalize the merits and demerits site selection of power plant.		BTL 6	Create
20.	Summarize the waste disposal options for Nuclear Power Plant.		BTL 5	Evaluate
PART – B				
1.	Describe, what you understand by power plant economics? Explain the fixed costs and operating costs of a power station.	(13)	BTL 1	Remember
2.	Summarize the elements which contribute to the cost of the electricity and how can the cost power generation be reduced?	(13)	BTL 2	Understand
3.	Discuss the cost of electrical generation? What are the various types of cost associated with power generation?	(13)	BTL 2	Understand
4.	Define tariff? Discuss and compare various tariff used in practice	(13)	BTL 1	Remember
5.	i) Explain the term depreciation and discuss various methods of calculating the depreciation of an electrical plant. ii) Explain load curves and load duration curves? Discuss their utility in the economics of generation	(7) (6)	BTL 4	Analyze

6.	<p>A generating stations as a maximum demand (MD) of 15 MW and the daily load curve on the station is as follows, 10pm to 05 am 2500 KW 01pm to 04pm 10000KW 05am to 07 am 3000KW 04pm to 06pm 12000KW ,07pm to 11am 9000KW 06 pm to 08pm 15000KW 11am to 01pm 6000KW 08pm to 10pm 5000KW Determine the size and the number of generator units, plant load factor, plant capacity factor, use factor and reserve capacity of plant.</p>	(13)	BTL 3	Apply
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7.	Explain the pollution control technologies including waste disposal options for coal power plant	(13)	BTL 4	Analyze
8.	<p>i) Illustrate the short note on nuclear waste disposal.</p> <p>ii) A central power station has annual factors as follows. Load factor = 60%, capacity factor = 40% and use factor = 45%. power station has a maximum demand of 15000 KW. Determine the annual energy production, reserve capacity over and above peak load hours per year not in service.</p>	(6) (7)	BTL 3	Apply
9.	Generalize in detail capital & operating cost of different power plants.	(13)	BTL 6	Create
10.	<p>i) List and discuss any 4 power tariff structure adopted by TANGEDCO.</p> <p>ii) Name the pollution control technologies adopted in thermal power plants and describe anyone</p>	(7) (6)	BTL 1	Remember
11.	Explain the pollution control technologies including waste disposal options for nuclear power plant.	(13)	BTL 4	Analyze
12.	<p>i) Name and elaborate on the elements that contribute to the cost of electricity.</p> <p>ii) Brief: Base load, peak load and average load of a thermal power plant.</p> <p>iii) Indicate the likely % cost of capital and operating cost of a thermal power plant take the like of the power plant as 25 years</p>	(4) (6) (3)	BTL 1	Remember
13.	<p>i) Discuss the pollution from thermal power plants.</p> <p>ii) Elucidate the objectives and requirements to tariff and general form of tariff.</p>	(7) (6)	BTL 2	Understand
14.	<p>i) Summarize short notes on site selection criteria.</p> <p>ii) Explain its merits and demerits</p>	(13)	BTL 5	Evaluate

PART-C				
1.	<p>The peak load on a thermal power plant is 75 MW. The loads having maximum demands of 35 MW, 20 MW, 15 MW and 18 MW are connected to the power plant. The capacity of the power plant is 90 MW and the annual load factor is 0.53. Calculate the:</p> <p>a) Average load on the power plant. b) Energy Supplied per year. c) Demand factor. d) Diversity factor.</p>	15	BTL 6	Create
2.	<p>List out the fixed and operating cost of steam power plant? How are they accounted for fixing cost of electricity</p>	15	BTL 5	Evaluate
3.	<p>The following data pertain to a power plant. Installed capacity = 200 MW , Capital cost = Rs.350 x 10⁷, Annual cost of field, taxes and salaries = Rs.55 x 10⁷ Rate of interest = 5% of the capital Rate of Depreciation = 6% of the capital Annual load factor = 0.65 Capacity Factor = 0.56 Energy used in running the plant auxiliaries = 4% of total units generated. Determine the (a) cost of power generation and (b) reserve capacity</p>	15	BTL 6	Create
4.	<p>i) Develop the procedure you would adopt to establish the unit cost of power generation from coal, solar and wind based power generation system (Hint: Life cycle cost analysis technique).</p> <p>ii) What is tariff ? Discuss with suitable examples of two part tariff and three part tariff.</p>	8 7	BTL 5	Evaluate