UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Programme Name: M.Tech Energy System & M.Tech Renewable Energy Engg. **Semester : II**
Course Name   : Smart & Micro Grid   **Time   : 03 hrs**
Course Code   : EPEC 8005   **Max. Marks : 100**
Nos. of page(s) : 02
Instructions   : Clearly mention any assumptions with proper justification.

SECTION A

S. No.		Marks	CO
Q 1	Explain the necessity and applications of smart Grid. Explain the various essential backbones of smart grid.	4	CO1
Q.2	Explain the role & importance of communication in smart grid. Explain the various communication techniques adopted in Smart Grid.	4	CO3
Q.3	Explain the cyber Security and its vital role in Smart Grid	4	CO3
Q.4	Explain the following: 1) Define Modulation. What is the various type of digital modulation schemes? 2) Why secondary of CTs are short-circuited?	2 2	CO3 CO2
Q.5	A) Explain the role of CT, PT, CBs & Relays in Micro Grid?	4	CO5

SECTION B

		Marks	CO
	With neat block diagram explain the 'Smart Meter' those are commercially available. As a Smart Grid expert, suggest any two additional features you wish to recommend as design modifications to improvise the system operation.	10	CO2
	A) Explain the importance of IT requirement in Smart Grid. What are the various issues associated with IT system and provisions to overcome these issues.	8	CO3
	B) Explain the Load Dispatch and associated constrains.	2	CO1
	Explain the various initiations taken by Indian government to encourage Smart-grid. What are the various policies that are floated to encourage smart grid? OR Explain the various smart grid pilot projects going on in India. Give your comments on the status and progress of them.	10	CO5
	A) Explain the role of numeric replays in improving Power System Stability	4	CO1
	B) Explain how AT & C losses can be reduced using HVDS scheme.	4	CO4
	C) Explain the structure of Electrical power system	2	CO1

SECTION-C

		Marks	CO
	A) With a neat diagram, explain the Distribution automation with role and importance of each equipment/technology.	15	CO2

	B) Explain the role of Energy storage in Micro Grid	05	CO5

An textile industry with contract demand of 500 kW has the daily load curve as following:

Duration				12-15	15-18	18-22		22-24
kW								260

The Electricity tariff is flat tariff rate of Rs. 5/- Per unit, however the ToD rate varies as follows:

Time	% Rate Variation	Remark
0 to 5.00	Discount of 18%	Please note: Premium charges are 'Zero' if company is operating at below 50 % of Contract demand.
5.00 to 10.00	Premium of 5%	
10.00 to 15.00	Flat Rate	
15.00 to 18.00	Premium of 20%	
18.00 to 20.00	Critical Premium of 30%	
20.00 to 24.00	Premium of 10%	

The industry has various equipment and processes which requires Hot Water (37 kW for 20 hours a day), Compressor (50 kW for 11 hours a day), Spinning Spindles (75 kW, for 24 Hours), Power Looms (100 kW, 24 Hours), Bleaching Machines (28kW for 16 hours a day), Cloth dryers (75 kW for 12 hours a day), Coloring equipment (28 kW for 4 hours a day), Lighting load (38 kW for 24 hours) etc. Company also have potential of 'possible waste heat recovery system', which can produce 35 kW (Maximum availability for 6 hours) @ cost of Rs. 6,00,000/-. (Neglect maintenance cost)

Company has recruited you to minimize of paying extra premium and possible bill minimization.

Draft a Hypothetical proposal for same to be presented to the management.

Note: Use graph sheet for representation of Load Curves

For reference the prevailing market rates are:

1) Grid interactive Solar Power plant: Rs. 40,000/- Per kWp

2) Solar Power Plant: Rs.85,000/- per kW with battery backup (Max. full load backup for 4 hours).

3) The wind mill cost: Rs. 70,00,000/- for 50 kW machine.

The diesel generation will cost Rs. 7,50,000/- for 100 kW, Cost of Generation will be Rs. 10/- per unit.

| 20 | CO4 |

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SECTION A

S. No.		Marks	CO
Q 1	Explain the Optimum Load Dispatch and associated constrains	4	CO1
Q.2	A) Explain the difference between PWM & PAM? B) Explain superiority of PSK over PWM in power line transmission?	2 2	CO3
Q.3	Explain the construction and working of Faraday Generator for Current measurement.	4	CO2

Q.4	Explain the following:
	    1) Reduction in Distribution losses by PF improvement
	    2) Peak Load Shaving
		2
		2
			CO4
			CO4

Q.5	Explain the impact of Micro Grid in society.	4	CO5

SECTION B

	A) Explain the need and importance of Bay Controller B) Based on 2003 Electricity Act, explain the vitality of Smart grid, in strengthening of economic status of Distribution System.	5 5	CO2 CO1
Q.7	With neat diagram and objectives, describe the Micro grid. Also describe the challenges and resolutions to overcome the challenges in installation and operation of Microgrid.	10	CO5
	Explain the need, role and importance of IT infrastructure requirement for the smooth and trouble free operation of Smart Grid. Explain Challenges and resolutions. OR Explain the various Coding mechanism used for data encryption.	10	CO3
	A) With neat diagram explain the communication network in Smart Grid System. B) With neat diagram explain V2G technology and support of Smart Grid in implementing the same.	5 5	CO3

SECTION-C

	A) As a case study, explain the 'Distribution Automation' which has been installed at UPES. B) List the Various task forces that are formed as per ISGF. As a Smart grid expert, if you are given opportunity to be member of any one of task force, how will you contribute to strengthen that Task force's outcomes.	15 5	CO2 CO5
Des	A Remotely located village is proposed to be electrified on the concept of micro grid. The village is surrounded by forest, river and mountains. There is availability of Sunlight and wind flow as well. The village is occupying 100 families. It is proposed to provide electricity to all residents using renewable energy sources.		

	The model village also ensure 10 street lights along with Electricity to each house.
	
	The household will be provided with 4 LED lamps of 12 W each, Two fans of 50 W each, Two charging points. The total power limit for each house is restricted at 300 W. The street light rating is 100 W.
	
	Develop a financial proposal with operating cost with following information.
	
	Power Market values of Available Power Plants:
	
	  a) Solar power plant of 20 kWp (average production of 90 kWh per day). Initial investment Rs. 8 Lakhs. Interest, depreciation, operation & maintenance cost 5 % of investment (Without Battery backup)
	
	  b) A wood gasifier, of 10 kW with initial cost of Rs. 2 Lakhs. 1 kg of wood able to produce 0.75 kWh of energy. One tonne wood costs Rs.600/- and Transportation cost of Rs. 50/- per kM/tonne. Annual Interest, depreciation, labour and maintenance cost 30% of initial investment.(Maximum capacity)
	
	  c) A wind power plant able to produce 120 kWh per day with an initial investment of Rs. 15 lakhs (with battery back up). Annual Interest, depreciation, operation & maintenance cost 20 % of investment.
	
	  d) A micro water turbine of 5 kW @ Rs. 5 lakhs, producing an average energy of 70 kWH per day during July to Nov (6 months) & 20 kWH per day during rest of the time. Annual Interest, depreciation, operation & maintenance cost 14 % of investment.
	
	  e) A stand by DG set of 10 kW able to produce electricity @ Rs. 15/- per unit.
	
	Distribution lines:
	
	  Distribution lines are leased @ Rs 20000 Lakh per year.
	
	  The distribution losses are 5 % of power delivered by lines.
		20	CO4