Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Programme Name: M.Tech Energy System & M.Tech Renewable Energy Engg. **Semester : III**
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

	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. B) Explain the Load Dispatch and associated constrains.	8 2	CO3 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 B) Explain how AT & C losses can be reduced using HVDS scheme. C) Explain the structure of Electrical power system	4 4 2	CO1 CO4 CO1
	SECTION-C		
	A) With a neat diagram, explain the Distribution automation with role and importance of each equipment/technology. B) Explain the role of Energy storage in Micro Grid	15 05	CO2 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) Solar Power plant: Rs. 40,000/- Per kW for grid interactive
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. 6.50 per unit.

20 | CO4

Name:

Enrolment No:

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Programme Name: M.Tech Energy System & M.Tech Renewable Energy Engg. **Semester : III**
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 Load flow with emphasis on active & reactive power control on various Buses.	4	CO1
Q.2	A) Explain the difference between PCM & PSK? B) Explain superiority of PWM over PAM in power line transmission?	2 2	CO3
Q.3	Explain the construction and working of Hall Effect Current transformer	4	CO2
Q.4	Explain the following: 1) Reduction of AT & C Losses using HVDS 2) Optical fiber communication.	2 2	CO4 CO3
Q.5	Explain the Role and need of Energy Storage in Micro Grid	4	CO5

SECTION B

	B) Explain the construction and Working of IED (numeric replay) C) With a neat diagram explain the Role of Smart Grid in revenue collection.	5 5	CO2 CO1
Q.6	Explain the Architecture of Smart Micro Grid which has Remote Monitoring System	10	CO5
	Along with Electrical & Electronic infrastructure, IT infrastructure is equally important in Smart Grid. Justify the statement. OR Explain the possible attacks and various measures taken to safeguard the IT infrastructure in Smart Grid.	10	CO3
	A) Explain the need and importance of HAN, LAN, WAN in Smart Grid. B) With neat diagram explain AMI.	5 5	CO3

SECTION-C

	A) With neat diagram, explain the Smart Grid provision at UPES that has been already established also explain what are the future provisions that can be incorporated in the existing Smart Grid? B) Explain the role of India Smart Grid Forum. Explain the various task forces and their roles	15 5	CO2 CO5
Des A rerrr	Design and develop a strategic business unit (SBU) for the following case of a micro smart grid. SBU shall give the details of tariff plan and financial balance sheet at the end of first year of commencement. With a neat diagram provide the location of each of the following generating plants. Case: Remote village is to be electrified with a micro grid. The village is surrounded by forest, river and mountains.		

Power

Market values of Available Power Plants:

a) Solar power plant of 100 kWp (average production of 450 kWh per day). Initial investment Rs. 60 Lakhs. Interest, depreciation, operation & maintenance cost 5 % of investment (Without Battery backup)

b) A wood gasifier, of 80 kW with initial cost of Rs.1 million. 1kg of wood able to produce 0.75 kWh of energy. One tonne wood costs Rs.1300/- 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 1200 kWh per day with an initial investment of Rs. 1.5 crore (with battery back up). Annual Interest, depreciation, operation & maintenance cost 20 % of investment.

d) A micro water turbine of 50 kW @ Rs. 50 lakhs, producing an average energy of 700 kWH per day during July to Nov (6 months) & 200 kWH per day during rest of the time. Annual Interest, depreciation, operation & maintenance cost 14 % of investment.

e) A stand by DG set of 50 kW able to produce electricity @ Rs. 10/- per unit.

Distribution lines:

Distribution lines are leased @ Rs.1 Lakh per year.

The operation cost of lines Rs. 15,000/- per month

The distribution losses are 5 % of power delivered by lines.

The daily load curve is as follows:

Time of day	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Load (kW)	120	130	150	220	180	140	130	140	190	210	200	160

20

CO4

Appro. 5 kms

Major road access to village

Forest at 2 km

N

River close by village