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**UNIVERSITY OF PETROLEUM AND ENERGY  
STUDIES**

**End Semester Examination, December 2017**

**Program: M.Tech Energy System**

**Semester-**

**M.Tech Renewable Energy Engineering**

**Subject (Course): Smart & Micro Grid**

**Max. Marks : 100**

**Course Code : MNEG 766**

**Duration : 3 Hrs**

**No. of page/s: 03**

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**Attempt all questions.**

**Section A (Each Question 4 Marks)**

- (CO1) Q.1. Do you feel, Smart Grid is essentially required technology for future?  
Justify your answer.
- (CO5) Q.2 Explain the Social impact of smart grid.
- (CO3) Q.3 Explain the role & need of Data Communication in Smart & Micro Grid.
- (CO5) Q.4 Briefly describe the status of Smart Grid in India.
- (CO4) Q.5 Explain the role of e-Vehicles as a part of Smart Grid.

**Section B (Each Question 8 Marks)**

- (CO5) Q.6 Briefly describe the role & functions of Smart Grid Forum of India. Also brief about the various task forces formed by ISGF.
- (CO2) Q.7 Explain the essential Five pillars & their role for any smart grid project.
- (CO2) Q.8 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 so as to improvise the system operation.
- (CO4) Q.9 Explain demand Side Management & Demand Side integration. Explain the various measures that are taken clip the peak demand.
- OR
- (CO4) Q.9 Explain the issues associated with 'Peak Demand'. Explain with the help of Smart grid technology, how issues associated with peak demand are addressed.
- (CO3) Q.10
- A) Give a schematic structure of the Cellular Mobile system.
- B) Elaborate the fact that "the prime advantage of digital communication is long distance transmission without adding noise.

### Section C (Each Question 20 Marks)

(CO4) Q.11 An textile industry with contract demand of 400 kW has the daily load curve as following:

Duration	0-3	3-5	5-9	9-12	12-15	15-18	18-22	22-24
kW	170	190	210	310	260	300	330	290

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 20%	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 (30 kW for 20 hours a day), Compressor (40 kW for 11 hours a day), Spinning Spindles (60 kW, for 24 Hours), Power Looms (80 kW, 24 Hours), Bleaching Machines (20 kW for 16 hours a day), Cloth dryers (60 kW for 12 hours a day), Coloring equipment (20 kW for 4 hours a day), Lighting load (30 kW for 24 hours) etc. Company also have potential of 'possible waste heat recovery system', which can produce 25 kW (Maximum availability for 6 hours) @ cost of Rs. 5,00,000/-. (Neglect maintenance cost)

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

Draft a Hypothetical proposal for same to be presented in front of management.

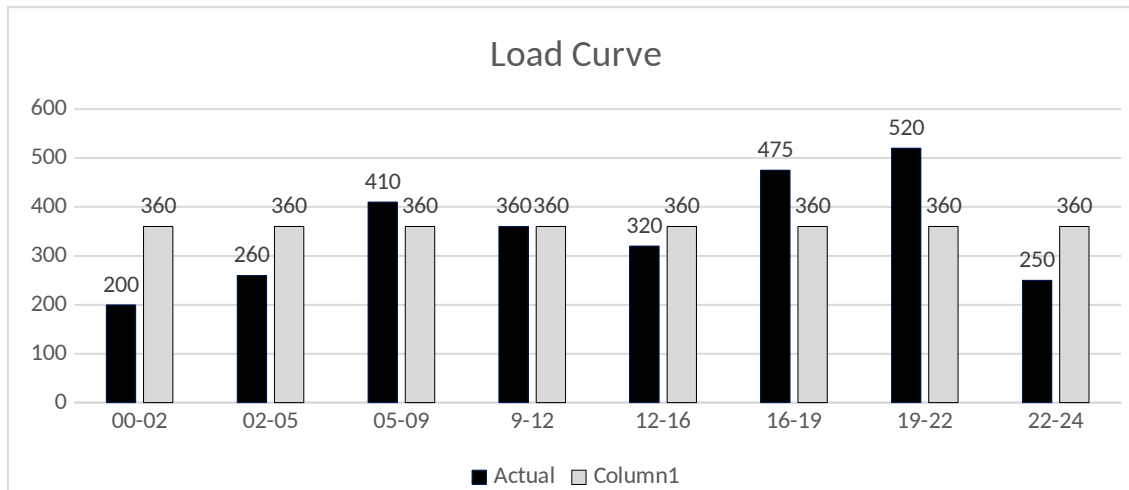
Note: Use graph sheet for representation of Load Curves

For reference the prevailing market rates are:

- 1) Solar Power plant: Rs. 45,000/- Per kW for grid interactive
- 2) Solar Power Plant: Rs. 70,000/- per kW with battery backup (Max. full load backup for 4 hours).
- 3) The wind mill cost: Rs. 65,00,000/- for 50 kW machine.
- 4) The diesel generation will cost Rs. 8,00,000/- for 100 kW, Cost of Generation will be Rs. 6.00 per unit.

OR

Q. 11 The load curve of a typical Distribution System is as following (Thick Black Bars)



The DISCOM has to meet the peak demand and hence the company has to install a 520 MW power plant. But installing a 520 MW will be requiring a very huge investment (Appro. 2000 crores). Instead DISCOM propose to set up Smart Grid and average out load to 360 MW (Light gray colored bars) and install a Generating station of 360 MW (appro. 1600 Crore).

As a Smart Grid Specialist, propose a hypothetical plan. The plan should give the complete layout, breakup of costs for various Investments and tariff rates (in terms of premium & discounts) so that customers are encouraged to use power during nonpeak loads. (It is also expected that DISCOM should not be in loss). The DISCOM expect average price of Rs. 5.00 Per unit. The power is supplied to approximately 10000 consumers covering 25 square km area.

Q.12 Explain the following: (Each 5 Marks)

(CO2) 1) With a neat Block diagram explain the grid interactive Solar Power System.

(CO2) 2) With neat Diagram explain HAN, NAN, LAN, WAN with respect to Smart Grid and their role in deployment of AMI

(CO3) 3) Role and Importance of IT Infra for Smart Grid

(CO4) 4) Block Diagram of Numeric relay with its importance in Smart Grid.