Name:
Enrolment No:

UPES
UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

End Semester Examination – May, 2019

Program/course: MBA (Power Management) | **Semester : 2nd**
Subject: Solar Power Development and Management | **Max. Marks : 100**
Code: PIPM 7005 | **Duration : 3 Hrs**
No. of page/s: 2

All questions shall be strictly answered in chronological order.

SECTION A		**[4*5 Marks = 20 Marks]**	
Ques 1	Briefly explain the impact of the following performance parameters on the economics of solar power generation: a) Performance Ratio b) CUF c) System efficiency d) Temperature Coefficient	**20**	**CO1, CO2**
SECTION B		**[6*5 Marks = 30 Marks]**	
Ques 2	State True or False for the following statements and justify your stand. All the questions in this section carry 5 marks each, out of which, 1 mark is for correctly stating True or False and 4 marks for justification. a) Operation and maintenance is easy for all types of solar power projects. b) Grid power is essential for the export of power from solar PV power plant to the grid. c) Concentrating solar power plants don't have large scale water requirements. d) CUF of solar thermal power plants is generally higher than that of solar PV power plants. e) Concentrating solar collector can utilize all types of solar radiation. f) The maximum output of solar PV panel remains constant throughout its useful life.	**30**	**CO1, CO2, CO3**
SECTION C **Answer any three questions from this section.**		**[3*10 Marks = 30 Marks]**	
Ques 3	Discuss the challenges and opportunities associated with solar power in India.	**10**	**CO2, CO3, CO4**
Ques 4	During last few years, solar power tariffs have been consistently falling in India. Discuss three main reasons for such a trend.	**10**	**CO2, CO3**

Ques 5	In the estimation of solar power tariff, principal component of loan and equity component is not included directly but it is indirectly accounted in the tariff. Justify.	**10**	**CO3, CO4**
Ques 6	In India, there has been large scale capacity addition of solar PV but very little installation of solar thermal power plant. Explain the reasons.	**10**	**CO2, CO4**
SECTION D **Answer any one question from this section.**		**[1*20 Marks = 20 Marks]**	
Ques 7	As an advisor to Government of India on Renewable Energy, suggest four policy initiatives for accelerated development of solar power industry in India.	**20**	**CO4**
Ques 8	Explain the working of a solar PV power plant with the help of a block diagram indicating PV arrays, Power-conditioning units (inverters), MCBs, Transformers, LT Panels, HT Panels, HT metering cubicle and Grid.	**20**	**CO1, CO2, CO3**

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SECTION A		**[4*5 Marks = 20 Marks]**	
Ques 1	Briefly explain the impact of the following performance parameters on the economics of solar power generation: a) CUF b) Performance Ratio c) Degradation d) Temperature Coefficient	**20**	**CO1, CO2**
SECTION B		**[6*5 Marks = 30 Marks]**	
Ques 2	State True or False for the following statements and justify your stand. All the questions in this section carry 5 marks each, out of which, 1 mark is for correctly stating True or False and 4 marks for justification. a) From power generation perspective, 1 MW solar power is equal to 1 MW coal power. b) Almost all solar power plants in India are located in barren areas. c) Concentrating solar power plants don't have large scale water requirements. d) CUF of solar thermal power plants is generally higher than that of solar PV power plants. e) Concentrating solar collector can utilize all types of solar radiation. f) The maximum output of solar PV panel remains constant throughout its useful life.	**30**	**CO1, CO2, CO3**
SECTION C **Answer any three questions from this section.**		**[3*10 Marks = 30 Marks]**	

Ques 3	Discuss the role of solar power in future electricity mix of India.	**10**	**CO2, CO3, CO4**
Ques 4	During last few years, solar power tariffs have been consistently falling in India. Discuss three main reasons for such a trend.	**10**	**CO2, CO3**
Ques 5	In the estimation of solar power tariff, principal component of loan and equity component is not included directly but it is indirectly accounted in the tariff. Justify.	**10**	**CO3, CO4**
Ques 6	In India, there has been large scale capacity addition of solar PV but very little installation of solar thermal power plant. Explain the reasons.	**10**	**CO2, CO4**
SECTION D **Answer any one question from this section.**		**[1*20 Marks = 20 Marks]**	
Ques 7	As an advisor to Government of India on Renewable Energy, suggest four policy initiatives for accelerated development of solar power industry in India.	**20**	**CO4**
Ques 8	The following are the values of parameters associated with a solar PV power project: a) Installed capacity = 1 MW b) Auxiliary consumption = 0 % c) CUF = 19.0 % d) Useful life = 25 years e) Capital cost = Rs 530.02 lacs / MW f) Tariff period = 25 years g) Debt (Loan) = 70 % h) Equity = 30 % i) Moratorium period = 0 years j) Repayment period (including moratorium) = 12 years k) Interest rate on loan = 12.76 % l) Return on equity for first 10 years = 20.00 % per annum m) Return on equity 11^{th} year onwards = 24.00 % per annum n) Discount rate = 10.70 % o) Depreciation rate for first 12 years = 5.83 % p) Depreciation rate 13^{th} year onwards = 1.54 % q) O & M charges (for working capital) = 1 month's O & M expenses r) Maintenance spare (for working capital) = 15% of annual O & M expenses s) Receivables (for working capital) = Rs 19.64 lacs (equivalent to two months revenue) t) Interest on working capital = 13.26 % u) Annual O & M expenses = Rs 7.00 lacs v) O & M expenses escalation = 5.72 % With the given values and procedure prescribed by CERC, estimate the **Cost of Generation per Unit** for the **First Year of Tariff Period.** Step-wise marking will be followed for this numerical.	**20**	**CO1, CO2, CO3**