Roll No: ----------

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B Tech Mechanical | **Semester – VII**
Subject (Course): Energy Management | **Max. Marks : 100**
Course Code : PSEG-442 | **Duration : 3 Hrs**
No. of page/s: 3

All questions carry equal marks SECTION-A (5*4)

Q1. (CO4) If feed of 100 tonnes per hour at 5% concentration is fed to a crystallizer, the product obtained at 25% concentration is equal to how much tonnes per hour. **(4)**

Q2. (CO3) Describe the objectives of the energy policy in an organization. List down the format of energy policy. **(4)**

Q3. (CO6) Define the IRR of a project and indicate its limitation and advantages. **(4)**

Q4. (CO2) Explain the Present Energy Scenario of India (in context to Coal, Natural Gas and Renewable Power). **(4)**

Q5. (CO3) Discuss in detail various Energy Efficiency projects handled by BEE. **(4)**

All Questions carry equal marks SECTION B (4*10)

Q6.(CO3) Briefly explain the concept of fuel and energy substitution by giving one example **(10)**

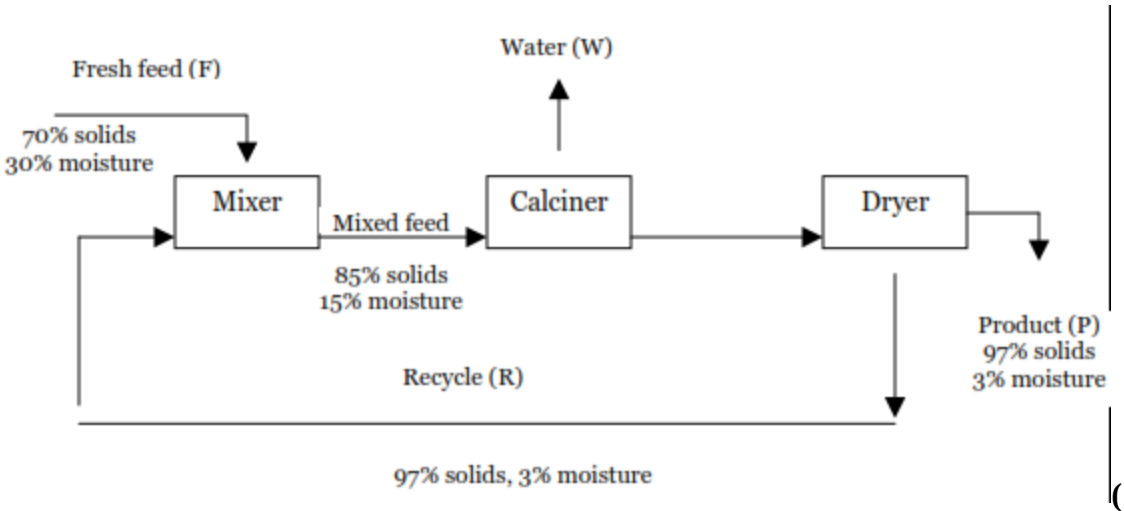
Q7. (a) (CO5) Discuss various ways to relate the plant energy consumption with production. **(5)**

(b) (CO5) Using CUSUM technique to calculate energy savings for 6 months period of 2003. For calculating total energy savings, average production can be taken as 4000MT/month. Refer data given below

2003 Month	Actual SEC, kWh/MT	Predicted SEC, kWh/MT
Jan	242	265
Feb	238	265
Mar	287	265
Apr	237	265
May	295	265
June	246	265

(5)

Q8. (CO4) In a particular drying operation, it is necessary to hold the moisture content of feed to a calciner to 15% (W/W) to prevent lumping and sticking. This is accomplishing by mixing the feed having 30% moisture (w/w) with recycle steam of dried material having 3% moisture (w/w). The dryer operation is shown in fig below. What fraction of the dried product must be recycled?



(10)

Q9. (CO7) Discuss in details about Kyoto Protocol and also discuss its implication on developed and developing countries. **(10)**

Attempt any one question **SECTION C** **(2*20)**

Q10. Write short notes on the following

i) **(CO1)** Benchmarking

ii) **(CO2)** Energy Pricing in India

iii) **(CO2)** NAPCC

iv) **(CO7)** CDM and Joint Implementation **(20)**

Q11. (CO6) Using the NPV method calculate the financial merits of the two proposed projects shown below in the table. The annual discount rate is 8% for each project

	Project 1	**Project 2**
Capital Cost	**30,000**	**30,000**
Year	**Net annual Savings Rs)**	**Net annual Savings (Rs)**
1	+6000	+6600
2	+6000	+6600
3	+6000	+6300
4	+6000	+6300
5	+6000	+6000
6	+6000	+6000
7	+6000	+5700
8	+6000	+5700
9	+6000	+5400
10	+6000	+5400
Total Net Savings at end of 10^{th} year	+60000	+60000

(20)

OR

Q12. (CO6) (a) (i) Construct a CPM diagram for the data given below
(ii) Identify the critical path. Also compute the earliest start, earliest finish, latest start & latest finish of all activities

Activity	**Precedent**	**Time, weeks**
A	Start	3
B	A	4
C	A	1
D	C	3
E	Start	2
F	B	2
Finish	D, E, F	--

(CO6) (b) Briefly explain steps in Project Management and also explain types of contracts used in Project Management. **(20)**

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All questions carry equal marks SECTION-A (5*4)

Q1. (CO4) An oil fired furnace is retrofitted to fire coconut shell chips. Boiler thermal efficiency drops from 82% to 72%. How much more, or less energy, in percent is spent to generate same amount of steam. **(4)**

Q2. (CO3) Discuss the important aspects of Integrated Energy Policy. **(4)**

Q3. (CO1) Explain the concept of Energy Management System giving example. **(4)**

Q4. (CO4) Explain the shankey diagram of furnace. **(4)**

Q5. (CO6) Explain in brief about the PDC (Project Development Cycle). **(4)**

All Questions carry equal marks SECTION B (4*10)

Q6. (CO4) A solution which is 80% oil, 15% usable by-products and 5% impurities, enters a refinery. One output is 92% oil and 6% usable by products. The other output is 60% oil and flows at the rate of 1000lt/hr (assume no accumulation present by volume)

Calculate

i) Flow rate of input.

ii) Percentage composition of the1000lt/hr output.

iii) Percent of the original impurities are in the 1000lt/hr output **(10)**

Q7. (CO6) Two energy conservation projects have been proposed. For the first project, a capital investment of Rs.10,000/- is required and the net annual saving is Rs. 5000/- for 5 years. For the second project, a capital investment of Rs. 12000/- produces a savings of Rs. 5000/- for first 2 years and Rs. 6000/- for next 3 years. Salvage value at the end of 5 years for the second project is Rs. 1000/-. Determine:

(i) Net present value for both the projects with a discount factor of 9%.

(ii) Profitability index for both the projects with a discount factor of 9%.

(ii) Internal rate of return for both the projects. **(10)**

Q8. (CO6) The details of activities for implementation of an energy efficient project is given below:

Activity	Preceding activity	Duration (days)
A	-	10
B	A	9
C	A	4
D	C	7
E	C	2
F	E	3
G	B, D	8
H	D	4
I	F,G,H	1

a) draw a PERT chart

b) find out the duration of the project

c) identify the critical path. **(10)**

Q9. (i) (CO1) Discuss in detail about fuel substitution and methods for matching energy usage to requirements.

(ii)(CO2) A thermic fluid heater with Furnace Oil (FO) is replaced by a Coconut chip fired boiler having the following details. Find out payback period based on the cost savings. Avg. efficiency of old system (Fuel Oil fired boiler) = 80 % Avg efficiency of the new system (Coconut chip fired boiler) = 70%

GCV of FO = 10200 kcal / kg
GCV of Coconut chips = 4000 kcal / kg
Heat duty = 15 Lakh kcal / hr
Annual operating hours = 7000 Hours
Investment of new system = Rs. 100 Lakhs
Cost of FO = Rs. 20 / litre
Cost of Coconut chips = Rs. 3000 / Ton
Sp. Gr. Of Fuel oil = 0.90 **(10)**

Attempt any one question **SECTION C** **(20*2)**

Q10. (CO6) Look at two purely fictitious lighting systems, A and B. Lighting System A is the existing system and Lighting System B is a proposed retrofit system which simply includes more-energy-efficient lamps and ballasts. They produce comparable light output.

	Lighting System A	Lighting SystemB (proposed)
No. of fixtures	100	100
Input Watts/Fixture	175	100
Hours of Operation/Year	3,000	3,000
Energy Consumption/Year (kWh)	525 / fixture	300 / fixture
Utility Cost/kWh	Rs 1.0	Rs 1.0
Cost of implementation	-	Rs 700/fixture

For above case study define and calculate:

a) Simple payback

b) Five-year cash flow

c) Simple return on Investment **(20)**

Q11 (CO6)(a) Explain in detail the steps in Project Management by giving suitable example **(10)**

(CO3) (b) Explain in detail the Salient Features of Energy Conservation Act 2001 **(10)**

OR

Q12. Explain the following terms with example:

1. **(CO7)** CDM Mechanism
2. **(CO6)** ESCO's role and Development
3. **(CO3)** NAPCC
4. **(CO5)** Energy Monitoring and Targeting
5. **(CO2)** Purchasing Power Parity **(20)**
