Reg. No.



VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING) ONLINE EXAMINATIONS, JANUARY-FEBRUARY 2021

Energy Auditing [ELE 4006]

REVISED CREDIT SYSTEM

Time: 3 Hours			Date: 03 February 2021	Max. Marks: 50			
Instructions to Candidates:							
	*	Answer ALL the questions					
	 Missing data may be suitably assumed. 						
1A.	Explain the importance of TOD (time of the day) tariff and its advantage to utilities and to users. List some of the Industries where TOD benefits can be fully utilized.						
<i>1B.</i>	(i) (ii)	Explain the concept o Briefly explain 'Rene which this requiremen	f Bachat Lamp Yojana (BLY)? wable Purchase Obligation (RPO)' and in ht can be met?	means by (03)			
1C.	(i) (ii)	What are the few in should consider durin What do you understa	nportant technical feasibility parameters g analysis of energy conservation opportu and by 'plant energy performance' (PEP)?	that one inities? (03)			
2 <i>A</i> . 2B.	The efficiency of a billet heating furnace with an output of 15 tonne/ hr was 32%. Find out the specific fuel consumption in litres/ tonne of billet heating and total fuel consumption per hour as per data given below: Billet heating furnace: Initial temp. = 50° C Final temp. = 1150° C Specific heat of billet = 0.12 kCal/ kgoC Density of fuel oil = 0.95 kg/ litre GCV of fuel oil = $10,000 \text{ kCal/kg}$ Determine the specific fuel consumption in litres/ tonne and total fuel consumption in litres/hr. (04) Explain the following terms in heat transfer with examples.						
2C.	 The Energy- production data (for Jan-June, 2011) of an industry follows a relationship : Calculated energy consumption = 0.5 P +220. A Waste heat recovery system was installed at end of June 2011 and further data was gathered up to December 2011. Using CUSUM technique, calculate energy savings in terms of ton of oil equivalent (toe) and the reduction in specific energy consumption achieved with the installation of waste heat recovery system. The plant data is given in the table below. 		(03) follows a nd further ton of oil achieved (03)				

2011-Month	Actual Energy Consumption, toe/month	Actual production, ton/month
Jan	620	760
Feb	690	960
Mar	<mark>6</mark> 35	790
Apr	628	830
Мау	545	<mark>6</mark> 10
Jun	540	<mark>6</mark> 70
July	590	760
Aug	605	820
Sep	670	940
Oct	582	750
Nov	512	610
Dec	540	670

- **3A.** (i) Explain the need for an Energy policy?
 - *(ii)* Describe responsibilities and duties of Energy Manager as assigned under The Energy Conservation Act, 2001?
- **3B.** An energy meter connected to a 3 phase, 18.75 kW pump shows 108 units consumption for six hours of operation. The load on the motor was steady. The consumer doubted the energy meter reading and electrical parameter such as current, voltage and power factor were measured. The measured values were 430 V line volts, 25 amps line current and 0.80 Power Factor. Find out if the energy meter reading is correct.
- **3C.** The suction head of a pump is 5 m below the pump centre line. The discharge pressure is 3 kg/cm2. The flow rate of water is 100 m3 /hr. Find out the pump efficiency if the actual power input at the shaft is 15 kW. **(03)**
- **4A.** (i) A 415 V, 15kW, 3-ph, 50Hz Induction motor operates at full load, with 88% efficiency and 0.85 power factor lagging:

a) Find the current drawn by the motor

b) If this motor is replaced by 92.5% energy efficient motor with 0.92 power factor, what will be the power savings in terms of k W and kVA?

(ii) Explain how a Variable Frequency Drive saves power in a three phase electric motor driven pumping system? What will be the reduction in power drawn by a motor by reducing the speed by half? **(04)**

- **4B.** (i) What are energy savings certificates (ESCerts) and explain the basis for their issue and trading under PAT scheme?
 - (ii) Explain different possible methods of electrical demand management in a plant electrical system to minimize maximum demand. (03)

(03)

'04)

- **4C.** Explain five energy saving measures for air conditioning system with suitable examples
- **5A.** (i) Construct a PERT/CPM network diagram for a project for which the data is given below
 - (ii) Compute the earliest start, earliest finish, latest start, latest finish and slack for all the activities
 - (iii) Also compute the project duration, identify critical activities and the critical path(s)

Activity	Predecessor	Time in weeks
Α	-	3
В	-	5
С	A	4
D	A	6
E	С	5
F	D	3
G	В	2
н	E,F	1
I	G,H	2

(04)

5B. The cost and estimated savings data for an energy saving retrofit project is given in table below.

Retrofit cost	Energy & demand savings	Maintenance cost savings
Rs. 1,00,000	6000 kWh/year & Rs.3800/year as demand charges	Annual maintenance cost savings will be Rs. 2000/

The key data is given below:

- Energy savings are based on Rs 3.00/kWh
- No changes in energy rates for 10 years
- The project has a 10 year life period

Calculate NPV for the upgrade option against 12% discount rate.

- (03)
- **5C.** (i) Explain the functioning of an Energy Service Companies (ESCO) in performance contracting.
 - (ii) Name two macro and micro factors considered in the sensitivity analysis of major energy saving projects. **(03)**