S J P N Trust's **Hirasugar Institute of Technology,Nidasoshi.** Inculcating Values, Promoting Prosperity Approved by AICTE and Affiliated to VTU Belagavi		E&E Engg. Dept. Academic Internal Assessment 2017-18 (Even)

FIRST INTERNAL ASSESSMENT

Sem: VIII | Sub: Energy Auditing & Demand Side management | Sub. Code:10EE842

Time: 3pm-4pm | Max. Marks: 25 | Date: 7/3/2018

Note: Answer two full questions, draw sketches wherever necessary.

Q. No		Discription of Question	Marks	CO	RBT Level
1	a	Explain the causes and disadvantages of low power factor.	7	428.4	L1-L2
		OR			
	b	A single phase motor connected to a 400V,50Hz supply takes 20A at a power factor of 0.7 lagging.Calculate the capacitance required in parallel with the motor to raise the power factor to 0.9 lagging.	7	428.4	L1-L3
	c	Derive an expression for most economical power factor considering constant active power. Draw relevant vector diagram.	6	428.4	L1-L4
		OR			
	d	A factory has a maximum load of 240 KW at 0.7 p.f. lagging with an annual consumption of 50000 units.The tariff is Rs 50/KVA of maximum demand plus 10 paise/unit. Calculate the flat rate of energy consumption. What will be the annual saving if power factor is raised to unity?	6	428.4	L1-L3
2	a	With a power distribution diagram, explain the location of capacitors	6	428.4	L1-L3
		OR			
	b	A factory which has a maximum demand of 175 KW at a power factor of 0.75 lagging is charged at a Rs.72/KVA per annum.If the phase advancing equipment costs Rs 120/KVAR, find the most economical power factor at which the factory should operate. Interest and depreciation total 10% of the capital investment on the phase advancing equipment.	6	428.4	L1-L3
	c	What is Tariff? Explain different types of Tariff commonly Used.	6	428.4	L1-L2
		OR			
	d	A 3 phase, 5 KW induction motor has a p.f. of 0.75 lagging. A bank of capacitors is connected in delta across the supply terminals and p.f. raised to 0.9 lagging. Determine the KVAR rating of the capacitors connected in each phase.	6	428.4	L1-L3

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SDM

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E&E Engg Dept
Exam
IA Scheme
2017-18 Even Sem

I. I. A

SCHEME OF EVALUATION

Sem: VII | Subject: Energy Auditing & DSM | Sub Code: 10EE842 | Date: 7/3/2018

Q. No.	Bit	Description	Marks	CO's	RBT
1	a.	To explain causes of Low P.f — 3 ∴ disadvantages of low P.f — 4m	7m	428.4	L_1-L_2
	b.	To Calculate $I_M = I_m \cos\phi$ = 14A — 1m $I_m = I_m \sin\phi$ = 14.28A — 1m Reactive comp. $I = I \sin\phi$ = 6.75A — 1m I_c = 7.5A — 2m C = 94.23μF — 2m	7m	428.4	L_1-L_3
	c.	To draw vector diagram of power triangle — 2m Derivation of Most economical P.f — 4m	6m	428.4	L_1-L_4
	d.	To calculate Annual bill — 2m Flat rate/unit — 1m Annual saving — 3m	6m	428.4	L_1-L_3
2	a.	Power distribution diagram of location of Capacitors — 4m Explanation — 2m	6m	428.4	L_1-L_3
	b.	Calculation of y = Rs 12/KVAR/annum — 2m ∴ Most economical P.f — 4m	6m	428.4	L_1-L_3
	c.	Definition of Tariff — 1m Types of Tariff — 5m	6m	428.4	L_1-L_2
	d.	Calculation of Φ_1 & Φ_2 — 2m Leading KVAR taken — 3m Rating of Capacitor/phase — 1m	6m	428.4	L_1-L_3

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SCHEME OF EVALUATION

Sem : VIII | Subject : Energy Auditing & D.S.M | Sub Code : 10EE842 | Date : 7/3/2018

Q. No.	Bit	Description	Marks	CO's
1	a.	Causes & Dis-advantage of low power factor.		

Causes: i) Most of the A.C Motors are of inductive type which have low lagging P.f

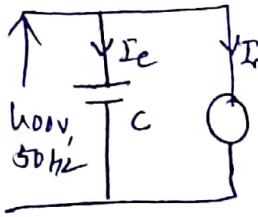
ii) Transformers draw a magnetizing current from the line. This current lags the voltage at an angle 90°

iii) Arc lamps, electric discharge lamps & industrial heating furnaces, welding equipment operate at low lag P.f

Dis-advantage:

i) Large KVA rating of equipment
ii) Greater Conductor size
iii) Large Cu. losses
iv) Poor voltage regulation
v) Reduced handling capacity of the system

b.



Active component of Current $I_m = I_m \cos\phi$

$= 20 \times 0.7 = 14A$

Active Comp. of $I = I\cos\phi = I \times 0.9$

$\therefore I = \frac{14}{0.9} = 15.55A$ $\left(\sin\phi_m = \sqrt{1-\cos^2\phi} = \sqrt{1-0.7^2} = 0.714\right)$

Reactive Comp. of $I_m = I_m \sin\phi_m = 20 \times 0.714$

$= 14.28A$

" $I = I\sin\phi = 15.55\sqrt{1-0.9^2} = 6.78A$

I_c = Reactive Comp. of I_m - Reactive Comp. of I

$= 14.28 - 6.78 = 7.5A$ But $I_c = V/X_c = V \times 2\pi fc$

$= 400 \times 2\pi \times 50 \times C$

$\therefore C = \frac{59.6}{7.5} \times 10^{-6} F = 59.6 \mu F$

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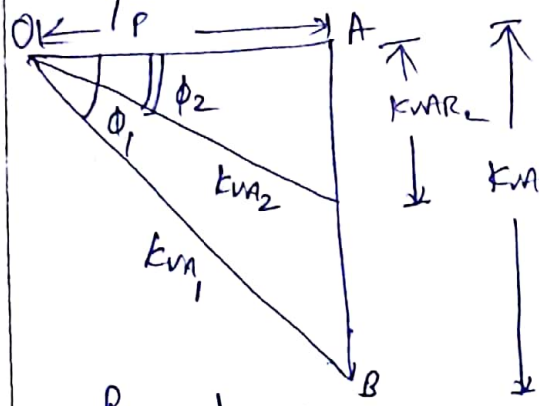
SCHEME OF EVALUATION

Sem : VIII | Subject : Energy Audity & D.S.M | Sub Code : 10EE842 | Date : 7/3/2018

Q. No.	Bit	Description	Marks	CO's
c		Expression for most economical P.f		



$\cos\phi_2 = \sqrt{1-\sin^2\phi_2}$

$= \sqrt{1-\left(\frac{y}{x}\right)^2}$

Power triangle

d. Maximum demand in KVA at a P.f of 0.7 $= \frac{240}{0.7} = 342.857$ KVA

∴ Annual bill = Demand charges + Energy charges

= Rs (50 × 342.857) + (0.1 × 50,000)

= Rs 22142.85

∴ Flat rate/unit = Rs $\frac{22142.85}{50,000}$ = Rs 0.4428 = 44.28 paise

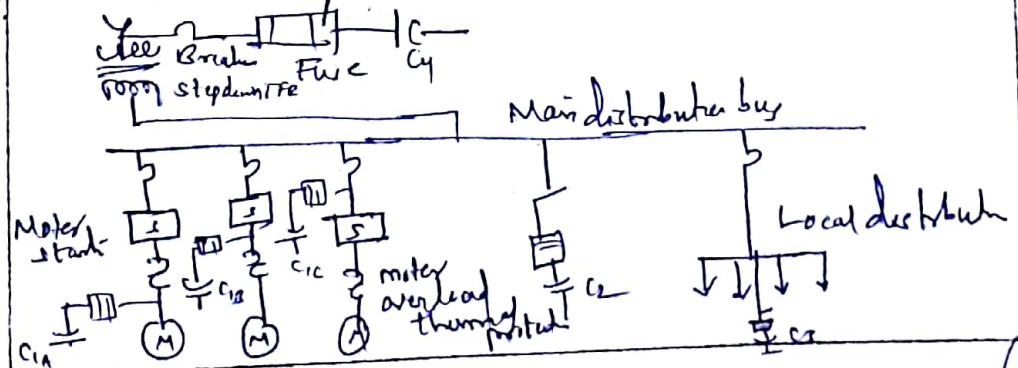
When Pf raised to unity the Maximum demand in KVA

$= \frac{240}{1} = 240$ KVA

Annual bill = Rs (50 × 240) + (0.1 × 50,000) = Rs 17,000

Annual saving = Rs (22142.85 − 17000) = Rs 5142.85

Q2 a. Location of Capacitor



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SCHEME OF EVALUATION

Sem: VII | Subject: Energy Auditing & DSM | Sub Code: 10EE842 | Date: 7/3/18

Q. No.	Bit	Description	Marks	CO's
	b.	$\cos\phi = 0.75$ lag. Maximum demand charges = Rs 72/KVA/annum Expenditure on phase advancing equipment = Rs 120×0.1 = Rs 12/KVAR/annum $\therefore$ Most economical p.f $\cos\phi_0 = \sqrt{1-(Y/X)^2} = \sqrt{1-\left(\frac{12}{72}\right)^2} = 0.986$ lag.		
	c.	The rate at which electrical energy is supplied to a consumer is known as Tariff Type of tariff 1) Simple or uniform rate tariff 2) Flat rate tariff 3) Block rate tariff 4) Two-part tariff 5) Maximum demand tariff 6) Power factor tariff 7) Three part tariff 8) Availability based tariff (ABT)		
	d.	$\cos\phi_1 = 0.75$ lag $\cos\phi_2 = 0.9$ lag Motor input: 5kW, $\eta = 100\%$ (assumed) $\phi_1 = \cos^{-1}(0.75) = 41.41^\circ$ $\phi_2 = \cos^{-1}(0.9) = 25.84^\circ$ Leading KVAR taken by the condenser bank $= P(\tan\phi_1 - \tan\phi_2)$ $\because \tan\phi_1 = \tan(41.41^\circ) = 0.8819$ $\tan\phi_2 = \tan(25.84^\circ) = 0.4843$ $= 5(0.8819 - 0.4843) = 1.99$ KVAR $\therefore$ Rating of capacitor connected in each phase $= 1.99/3 = 0.663$ KVAR.		

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SECOND INTERNAL ASSESSMENT

Sem :VIII **Sub: Energy Auditing & Demand Side management** **Sub. Code: 10EE842**
Date:12/04/2018 **Time:3:00PM-4.00PM** **Max. Marks: 25**

Note: Answer two full questions, draw sketches wherever necessary.

Q. No		Discription of Question	Marks	CO	RBT LEVEL
1	a	What is demand side management (DSM)? What are the benefits of DSM to supply industry/utility, customer and Society?	7	CO428.5	L2
	b	Explain peak clipping, load shifting and valley filling with respect to DSM	6	CO428.5	L3
		OR			
2	a	Explain load priority techniques with respect to DSM.	7	CO428.5	L3
	b	What is time of -day pricing? With the help of suitable Example, explain how this helps in an efficient DSM.	6	CO428.5	L3
3	a	Explain Load management as a DSM Strategy.	6	CO428.5	L3
	b	Discuss tariff options for DSM.Which tariffs promote DSM?	6	CO428.5	L3
		OR			
4	a	Explain energy conservation opportunities in cooling , heating and industrial sector.	6	CO428.6	L3
	b	Explain energy conservation opportunities in illumination system and Agricultural sector	6	CO428.6	L3

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SCHEME OF EVALUATION

Sem : VIII | Subject : Energy Auditing & DSM | Sub Code : 10EE842 | Date : 12/4/2018

Q. No.	Bit	Description	Marks	CO's
1	a	To explain Concept of D.S.M — 2m Benefits of D.S.M to Utility/Consumer/Society — 5m	7m	428.5
	b.	To explain peak clipping — 2m load shifting — 2m valley filling — 2m	6m	428.5
2	a.	To explain load priority categories 3x2 = 6 — 7m		428.5
	b.	To explain Time of day pricing with example	6m	428.5
3	a.	To explain load Management as a DSM strategy with diagram of Generation cost v/s load curve	6m	428.5
	b.	To explain tariff options for DSM Time of day (T.O.D) Tariff — 2m Seasonal Tariff — 2m Curtailable/Interruptible rate — 2m	6m	428.5
4	a.	To explain energy Conservation opportunities in Cooling system — 2m heating system — 2m Industrial Sector — 2m	6m	428.6
	b.	To explain E.C.O in illumination system — 3m Agricultural sector — 3m	6m	428.6

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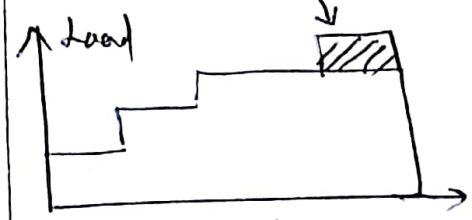
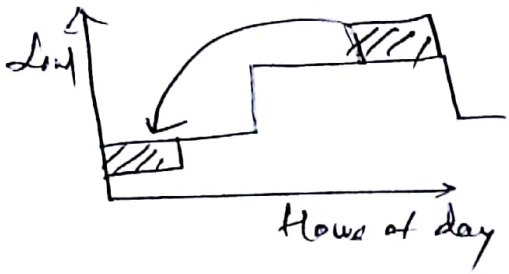
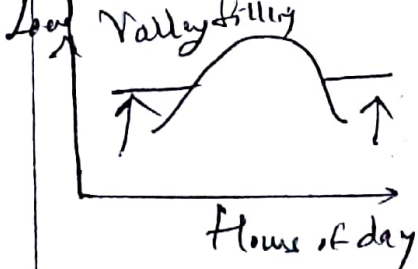
SCHEME OF EVALUATION

Sem : VII | Subject : EADSM | Sub Code : 10EE862 | Date : 12/11/17

Q. No.	Bit	Description	Marks	CO's
1	a	D.S.M is the modification of a Customer's electrical usage pattern to i) Reduce peak consumption ii) Load shifting Benefits of D.S.M to 1) Supply industry / Utility : Reduction in bill, Reduction in new power plant, T&D n/w, Reduction in air pollution etc 2) Customer : Satisfy electricity demands, Reduce the cost, improve the value of service, etc 3) Society : Reduce environmental degradation, Conserve resources, protect the environment, Maximize Customer welfare.		
	b.	Peak clipping  		
		Load shifting  		
		Valley filling  		
2	a.	Load priority techniques 1) Direct load control 2) Local load control 3) Distributed control		

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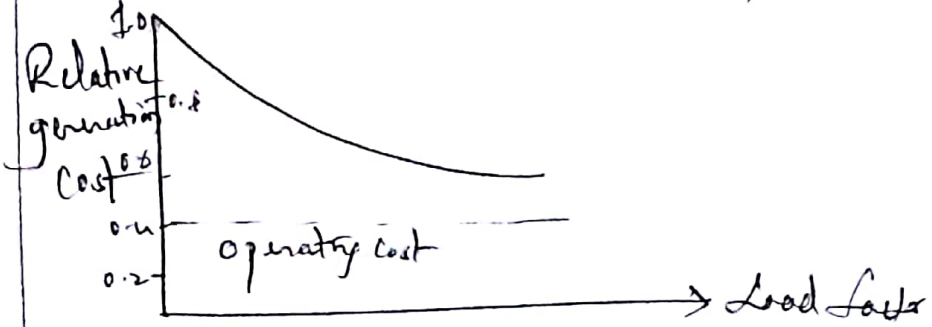
SCHEME OF EVALUATION

Sem : VIII | Subject : EADSM | Sub Code : 10EE842 | Date : 12/4/18

Q. No.	Bit	Description	Marks	CO's
	b.	The rates which vary according to the time of the day is called time of day pricing.		
3	a	Load Management as DSM strategy		



Variation of Generation cost with load factor

	b.	Tariff options for D.S.M The tariff structure which can promote D.S.M activities are i) Time of the day Tariff (T.O.D) ii) Seasonal Tariff iii) Curtailable / Interruptible (C/I) rates.		
4	a.	The efficiency of a cooler can be increased by an * Improvement in efficiency of fan motor & Pump motor water circulating pump. * Energy saving in water heating can be achieved by using better insulation techniques like use of insulation blanket of fiber glass jacketed with vinyl.		

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SCHEME OF EVALUATION

Sem : VIII | Subject : EAOSM | Sub Code : 10EE842 | Date : 12/4/18

Q. No.	Blt	Description	Marks	CO's
		* Electric motors are widely used in industry. Use of high efficiency motors can save energy of 2-5%.		
		* Power electronic variable speed drives can be used		
	b.	* Use of energy efficient lamps like CFL, LED in place of Conventional lamps. CFL has long life and environmental friendly.		
		* Use of electronic ballasts in place of magnetic chokes		
		* Agriculture sector account for about 30% of electricity consumption in India		
		* Improved efficiency of agriculture pumpsets can lead to energy savings.		
		* Use of drip irrigation system save energy.		

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THIRD INTERNAL ASSESSMENT

Sem :VIII **Sub: Energy Auditing & Demand Side management** **Sub. Code: 10EE842**
Date:19/05/2018 **Time:3:00PM-4.00PM** **Max. Marks: 25**

Note: Answer two full questions, draw sketches wherever necessary.

Q. No		Discription of Question	Marks	CO	RBT LEVEL
1	a	Explain how energy sources are classified broadly? Give example for each classification.	7	CO428.1	L2
	b	Discuss the Energy scenario in the world and India.	6	CO428.1	L2
		OR			
2	a	With respect to the supply system summarize the points in the distribution code.	7	CO428.1	L2
	b	Write a note on objectives of energy conservation act 2001.	6	CO428.1	L2
3	a	What are the energy management strategies? Explain them in brief.	6	CO428.3	L3
	b	Give the 10 methodology steps for detailed energy audit and explain each one in brief.	6	CO428.3	L3
		OR			
4	a	What are energy audit instruments?Explain each one of them.	6	CO428.3	L3
	b	Write a short note on " Energy use profile"	6	CO428.3	L3

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IA

SCHEME OF EVALUATION

Sem : VIII | Subject : Energy Auditing & D.S.M | Sub Code : 10EE842 | Date : 19/5/2018

Q. No.	Bit	Description	Marks	CO's
1	a	To explain classification of energy sources — 5 Example for each classification — 2	(7)	428.1
	b.	To explain energy scenario in world — 3 " " in India — 3	(6)	428.1
2	a	To explain electrical distribution code — (5 points)	7	428.1
	b.	To explain objective of energy conservation act 2001	6m	428.1
3	a.	To explain energy management strategies (3 points)	6m	428.3
	b.	To explain 10 step methodology for detailed energy audit	6m	428.3
4	a.	To explain energy audit instrument (Any 3)	6m	428.3
	b.	To explain energy use profile	6m	428.3

Course Coordinator

Module Coordinator

HOD

SCHEME OF EVALUATION

Sem : VIII | Subject : Energy Auditing & D.S.M | Sub Code : ~~15EE842~~ 10EE842 | Date : 19/5/18

Q. No.	Bit	Description	Marks	CO's
1	a	Classification of Energy Source		
		* Primary and Secondary energy sources		
		Fossil fuels like Coal, lignite, oil, naturalgas, nuclear, biomass etc		
		* Commercial energy & Non-Commercial energy sources.		
		C.E is used by industrial, agricultural, transport, domestic & Commercial uses in electricity, coal & other available petroleum fuels.		
		N.C.E - Firewood, cattle dung, agrowaste, solar heat, wind etc		
		* Renewable & Non-renewable energy		
		↳ Coal, oil, gas etc		
		↳ Wind, sun, geothermal, tidal waves hydro etc		
	b	Energy Scenario in the World		
		* Major growth in energy demand is projected in developing countries and 2 billion people lack access to affordable & reliable energy.		
		* Word coal reserves are likely to last Over 200 yrs.		
		* Almost 65% of world's coal use is for electricity.		
		* R.E Consumption is expected to increase by 80%.		
		Energy Scenario in India		
		* The electricity sector in India has an installed capacity of 255 GW. * India become the world's third largest producer of electricity.		
		* Major C.E. Consumption Sectors are industry 49%. transpat 22%. domestic 10%. agriculture 5% & other 14%		

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SCHEME OF EVALUATION

Sem : VIII | Subject : E.A & D.S.M | Sub Code : 10EE842 | Date : 19/5/18

Q. No.	Bit	Description	Marks	CO's
2	a.	Electrical Distribution code Summary of electricity Act 1948 includes i) Administration information for grant of connections, billing, Connected Load, Contract demand, recovery of dues etc ii) Information regarding service lines, charges, switch etc iii) System of earthing iv) Tariff application for different consumers. v) Information about demand load & diversity factor.		
	b.	Energy Conservation Act 2001 Summary * The establishment & incorporation of B.E.E * Transfer of assets, liabilities of energy management cells etc * Power of central & state government to facilitate & enforce the efficient use of energy & its conservation * Finance, accounts & audit of Bureau * Penalties & adjudication.		
3	a	Energy management strategies 1) Identify a strategic corporate approach 2) Appoint Energy manager 3) Set up an Energy monitoring & Reporting system 4) Conduct Energy audit 5) Formalize an energy management policy statement 6) Prepare & undertake a detailed project implementation plan 7) Implement a staff awareness & training program 8) Annual review.		

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SCHEME OF EVALUATION

Sem : VIII | Subject : EADSM | Sub Code : 10EE842 | Date : 19/5/18

Q. No.	Bit	Description	Marks	CO's
	b	10 step methodology for detailed E.A.		
		Step 1 - Plan & organize		
		2 - Conduct meeting		
		3 - Primary data collection, Flowdiagram etc		
		4 - Conduct survey & Monitory		
		5 - Conduct experiment		
		6 - Analysis of energy use		
		7 - Identification & development of energy Conservation opportunity		
		8 - Cost benefit analysis		
		9 - Reporting & presentation to top Management		
		10 - Implementation & Follow up.		
4	a.	Energy Audit Instrument		
		Electrical measuring instrument Combustion Analyzer, Fuel efficiency monitor, Pyrite, Contact thermometer, Infrared thermometer, Water flow meter, Tachometer, Stroboscope, Lux meter.		
	b.	Energy use profile		
		Audit req to construct E.U profile		
		Envelop audit, functional audit, Process audit.		
		Transportation audit, Utility audit		
		How much energy is spent for each function such as lighting, process & building, heating & Ventilation		

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