Code: 9A02801

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

PRINCIPLES OF POWER QUALITY

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions.
All questions carry equal marks.

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1 (a) What is power quality? And explain the significance of power quality.
(b) Draw and explain CBEMA and ITI curves.

2 (a) Write a short note on estimating the sag severity during full voltage starting.
(b) What are the fundamental principles of protections? Explain.

3 Explain about various sources of transient over voltages.

4 (a) Write the impact of voltage distortion on current distortion.
(b) Explain the commonly used indices for measuring the harmonic content in the waveform.

5 Explain the principles of controlling harmonics.

6 Explain in detail the role of capacitors for voltage regulation.

7 Explain various power quality contracts in detail.

8 (a) Write a short note on power quality monitoring standards.
(b) Explain about any one power quality measurement equipment.

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Code: 9A02801

2

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

PRINCIPLES OF POWER QUALITY

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions.
All questions carry equal marks.

*****

1 (a) What is power quality and what is voltage quality? Explain how the power quality is equal to voltage quality.
(b) Explain about power quality evaluation procedure.

2 Explain about the procedural steps involved in the estimation of voltage sag performance.

3 (a) What are the fundamental principles of over voltage protection of load equipment? Explain.
(b) Explain how the Isolation transformers and low pass filters are useful for over voltage protection.

4 What are the various harmonic sources from industrial loads? Explain.

5 Explain the various devices for controlling harmonic distortion.

6 (a) Explain the concept of feeder voltage rise due to shunt capacitors.
(b) Explain the working of any one device for voltage regulation.

7 Explain the various power quality indices for assessing the quality of service with respect to harmonic voltage distortion.

8 (a) Write a short note on historical perspective of power quality measuring equipment.
(b) Explain the various power quality monitoring considerations.

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Code: 9A02801

3

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

PRINCIPLES OF POWER QUALITY

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions.
All questions carry equal marks.

*****

1 (a) Explain about long-duration voltage variations.
(b) Write a short note on (i) Oscillatory transients (ii) Waveform distortion.

2 (a) Explain about sources of sags and interruptions.
(b) Write a short note on over current coordination principles.

3 Describe how utilities can deal with problems related to capacitor switching transients.

4 Explain the concept of power system qualities under nonsinusoidal conditions.

5 (a) Write a short note on effects of harmonics.
(b) Explain the harmonic distortion evaluation procedure.

6 (a) Explain the concept of feeder voltage rise due to series capacitors.
(b) Explain the effect of line drop compensation on voltage profile.

7 Describe various RMS voltage variation indices.

8 Explain about various power quality measurement equipment.

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Code: 9A02801

4

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

PRINCIPLES OF POWER QUALITY

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain about short-duration voltage variations.
(b) Write a short note on (i) Impulsive transients (ii) Voltage imbalance.

2 Explain about various solutions at the end user level protection.

3 Explain various strategies for utilities to decrease the impact of lightning.

4 (a) Define harmonic distortion and write a short note on it.
(b) What are the various harmonic sources from commercial loads? Explain.

5 What are the effects of harmonics? And explain the harmonic distortion evaluation procedure.

6 (a) Explain the principles of regulating the voltage.
(b) Explain the working of various devices for voltage regulation.

7 (a) Describe the process of power quality bench marking.
(b) Explain the following power quality contracts
(i) Harmonic agreements.
(ii) Example contract.

8 Explain the various power quality monitoring considerations.

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Code: 9A02802

1

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

UTILIZATION OF ELECTRICAL ENERGY

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) State and explain laws of illumination.

(b) If a lamp of 200 cp is placed 1m below a plane mirror which reflects 90% of light falling on it, determine illumination at a point 3 m away from the foot of the lamp which is hung 4 m above ground.

2 (a) Explain the method of resistance heating in detail.

(b) A slab of insulating material 150 sq cm in area and 1 cm thick is to be heated by dielectric heating. The power required is 400 W at 30×10^6 cps. Materials has permittivity of 5 and power factor of 0.05. Determine voltage necessary.

3 (a) Explain briefly the type of Gas welding.

(b) Make a comparison between resistance welding and arc welding.

4 (a) Briefly discuss the electro deposition.

(b) State and explain Faraday's laws of electrolysis.

5 (a) What factors govern the selection of a motor for particular application?

(b) A 3-phase 4 pole 50 Hz induction motor has a resistance of 0.25 Ω ph and runs at 1440 rpm at full load. Determine the external resistance to be connected to the rotor circuit to lower down the speed to 1200 rpm. Assume torque to remain constant.

6 (a) Explain the type of regenerative braking in detail.

(b) What are the advantages of electric breaking?

7 (a) Discuss the speed-time curves for main line services.

(b) A train has schedule speed of 60 km/hr between the stops which are 6 km apart. Determine the crest speed over the run assuming trapezoidal speed time curve. The train accelerates at 2 km/hr/sec and retards at 3 km/hr/sec. Duration of stops is 60 sec.

8 What do you understand by the specific energy consumption and what factors affect the specific energy consumption.

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Code: 9A02802

2

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

UTILIZATION OF ELECTRICAL ENERGY

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain with sketch the principle and operation of incandescent lamp and enumerates its advantages and disadvantages.

(b) A lamp with MSCP of 1000 is suspended at a height of 1.2 m. Determine (i) Total flux emitted by the lamp. (ii) Illumination just below the lamp.

2 Explain the different methods of electric heating and their advantages and disadvantages.

3 (a) Explain briefly the type of electric arc welding.

(b) Briefly discuss the welding electrodes of various metals.

4 (a) Discuss briefly the power supply for electrolysis.

(b) What is polarization and how its bad effects on electro deposition process can be reduced?

5 (a) What are the various methods employed for speed control of DC motors?

(b) A 200 V, 10 HP motor has shunt and armature resistance of 100 Ω and 0.25 Ω respectively. Calculate the resistance to be inserted in the armature circuit to reduce the speed by 20%. Assuming that torque remains constant the efficiency of the motor is 80%.

6 (a) Make a comparison between AC and DC traction.

(b) How the electric traction system is classified? Briefly discuss.

7 (a) Discuss the speed-time curves for urban service.

(b) A sub urban electric train has a maximum speed of 70 km/hr. The schedule speed including a station stop of 30 sec in 45 km/hr. If the acceleration is 1.5 km/hr/sec. Find the value of retardation when the average distance stops is 6 m.

8 What is specific energy consumption? Derive the expression for specific energy consumption.

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Code: 9A02802

3

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

UTILIZATION OF ELECTRICAL ENERGY

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain with sketch the principle and working of sodium vapour lamp and enumerate its advantages and disadvantages.

(b) A 250 V lamp takes a current of 1 A and produces a total flux of 4000 lumens. Determine (i) MSCP of the lamp. (ii) The efficiency of the lamp.

2 (a) What are the specific advantages and applications of dielectric heating?

(b) A piece of an insulating material is to be heated by dielectric heating. The side of the piece is 10 × 10 × 3 cm^3. A frequency of 20 MHz is used and power absorbed is 400 Watts. Calculate the voltage necessary for heating and current that flows in the material. The material has a permittivity of 5 and a power factor of 0.05.

3 Explain the different methods of electric welding and their relative advantages.

4 Discuss the various applications of electrolysis in detail.

5 (a) Write short notes on load equalization.

(b) A series motor with series field and armature resistance of 0.06 Ω and 0.04 Ω respectively is connected across 220 V mains. The armature takes 40 A and its speed is 900 rpm. Determine its speed when the armature takes 75 A from this machine and excitation is increased by 15%.

6 (a) What are the special features of traction motors?

(b) What are the advantages and disadvantages of electric traction?

7 (a) Write short notes on mechanism of train movement.

(b) A train has schedule speed of 30 km/hr over a level track distance between stations being 1 cm. Duration of stop is 20 sec. Assuming braking retardation of 3 km/hr/sec and maximum speed 25% greater than average speed, calculate acceleration required to run the service.

8 What is coefficient of adhesion? How the value of coefficient of adhesion affects the slipping and skidding of the driving wheels of traction unit?

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Code: 9A02802

4

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

UTILIZATION OF ELECTRICAL ENERGY

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Briefly explain the requirements of good lighting scheme.

(b) A 250 cp lamp is hung 4 m above the centre of a circular area of 6 m diameter. Calculate the illumination at the (i) Centre of area. (ii) Periphery of the area. (iii) Average illumination.

2 (a) Explain any one method of electric heating in detail.

(b) The power required for dielectric heating of a slab of 150 sqcm in area and 2 cm thick is 200 W at frequency of 30 MHz. The material has relative permittivity of 5 and power factor of 0.05. Determine the voltage necessary and current flowing through the material.

3 (a) Explain briefly the type of resistance welding.

(b) Write short notes on defects in welding.

4 (a) Discuss the various laws of electrolysis.

(b) Discuss the advantages of reverse current process of electro plating.

5 (a) What are relative advantages and disadvantages of DC and AC electric drives?

(b) A 200 V shunt motor having armature resistance of 0.4 ohm takes armature current of 20 A on full load and runs at 600 rpm. If resistance of 0.5 ohm is placed in the armature circuit find the speed at (i) Full load torque. (ii) Half full load torque. (iii) What is the ratio of starting torque to full load torque?

6 (a) Explain the type of rheostatic braking in detail.

(b) What is electric braking? Explain the need electric breaking.

7 (a) Briefly discuss speed-time curve for sub-urban service.

(b) An electric train is to have acceleration and breaking retardation of 0.8 km/hr/sec and 3.2 km/hr/sec respectively. If the ratio of maximum to average speed is 1.3 and time for stop is 26 sec, find the schedule speed for a run of 1.5 km. Assume simplified trapezoidal speed time curve.

8 Write short notes on:

(a) Specific energy consumption.

(b) Adhesive weight.

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Code: 9A02803

1

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

MODERN CONTROL THEORY

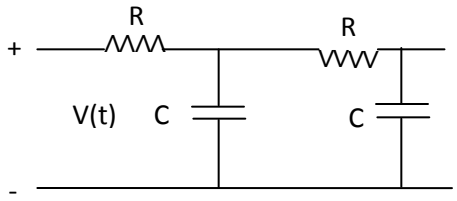
(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions.
All questions carry equal marks.

*****

1 (a) Obtain solution of state equation $\dot{X}$= AX+BU.
(b) Obtain the state model of electrical network shown in the figure.



2 Define controllability and check the controllability of the system by Gilbert's method.

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\\ \dot{X}_3\end{bmatrix} = \begin{bmatrix}-1 & 0 & 0\\ 1 & -2 & 0\\ 2 & 1 & -3\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix} + \begin{bmatrix}10\\ 1\\ 0\end{bmatrix} U$$

3 (a) Write short notes on control system design by pole placement using state feedback.
(b) Consider the system described by the state model $\dot{X}$= AX, Y=CX.

where A = $\begin{bmatrix}-1 & 1\\ 1 & -2\end{bmatrix}$, C = $[1 \quad 0]$

Design a full order state observer. The desired Eigen values for the observer matrix are $\mu_1 = -5$, $\mu_2 = -5$.

4 Obtain the describing function of relay with dead-zone and hysteresis.

5 (a) Write short notes on singular points.
(b) Write a brief notes on construction of phase trajectories by delta method.

6 Briefly explain all the methods of constructing all Liapunov functions for non-linear systems.

7 (a) Explain minimum-time problem.
(b) Explain output regulator problem.

8 Briefly explain Euler-Lagrange equation.

*****

Code: 9A02803

2

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

MODERN CONTROL THEORY

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions.

All questions carry equal marks.

*****

1 Obtain the state transition matrix e^{At} by canonical method for the following state model

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\\ \dot{X}_3\end{bmatrix} = \begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix} + \begin{bmatrix}0\\ 0\\ 2\end{bmatrix} U;\quad Y = \begin{bmatrix}1 & 0 & 0\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix}$$

2 Define observability and check the observability of the system by Gilbert's method.

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\\ \dot{X}_3\end{bmatrix} = \begin{bmatrix}0 & 0 & 1\\ -2 & -3 & 0\\ 0 & 2 & -3\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix} + \begin{bmatrix}0\\ 2\\ 0\end{bmatrix} U;\quad Y = \begin{bmatrix}1 & 0 & 0\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix}$$

3 Consider a linear system described by the transfer function $\frac{Y(S)}{U(S)} = \frac{10}{S(S+1)(S+2)}$; Design a feedback controller with a state feedback so that closed loop poles are -2, -1$\pm$ ji.

4 (a) Write short notes on common nonlinearities.

(b) Obtain the describing function of saturation non-linearity.

5 For a non-linear system described by the equation

$$\ddot{X} - (1 - \dot{X})^2\,\dot{X} + 2X + X^2 = 0$$

Find and identify all singularities.

6 (a) Explain minimum energy problem.

(b) Explain state regulator problem.

7 State and explain Liapunov's stability theorems.

8 Explain constrained minimization with suitable example.

*****

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

MODERN CONTROL THEORY

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions.

All questions carry equal marks.

*****

1 For a system represented by $\dot{X}(t) = AX(t)$. The response is $X(t) = \begin{bmatrix} e^{-2t} \\ -2e^{-2t} \end{bmatrix}$ when $X(0) = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$ and $X(t) = \begin{bmatrix} e^{-t} \\ -e^{-t} \end{bmatrix}$ when $X(0) = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ Determine state transition matrix and system matrix A.

2 The state model of a system is given by

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \\ \dot{X}_3 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 \\ -2 & -3 & 0 \\ 0 & 2 & -3 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} U; \quad Y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix}$$

Convert the state model to observable phase variable form.

3 (a) Explain the state full order observer with block diagram.

(b) What is state observer? What is the need for state observer? Give Ackermann's formula to find state observer Gain matrix G.

4 Obtain the describing function of Backlash Non-linearity.

5 Explain the construction of phase trajectory by Isocline method.

6 (a) Consider the system described by equations $X(K+1) = \begin{bmatrix} 0.5 & 1 \\ -1 & -1 \end{bmatrix} X(K)$ using direct method of Liapunov. Determine stability of equilibrium state.

(b) Consider the non-linear system described by equations;

$$\dot{X}_1 = -3x_1 + x_2$$
$$\dot{X}_2 = x_1 - x_2 - x_2^3$$

Investigate stability of equilibrium state.

7 (a) Explain minimum fuel problem.

(b) Explain infinite time regulator problem.

8 Briefly explain Pontryagin's minimum principle.

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Code: 9A02803

4

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

MODERN CONTROL THEORY

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 The state model of the system is given by

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\\ \dot{X}_3\end{bmatrix} = \begin{bmatrix}0 & 0 & 1\\ -2 & -3 & 0\\ 0 & 2 & -3\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix} + \begin{bmatrix}0\\ 2\\ 0\end{bmatrix} \text{U;}\quad \text{Y} = \begin{bmatrix}1 & 0 & 0\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix}$$

Convert state model to controllable phase variable form.

2 (a) Compute state transition matrix e^{At} by Cayley-Hamilton theorem for $A = \begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}$.

(b) Compute state transition matrix using Laplace transform method when $A = \begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}$.

3 A single input system is described by state equation

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\\ \dot{X}_3\end{bmatrix} = \begin{bmatrix}-1 & 0 & 0\\ 1 & -2 & 0\\ 2 & 1 & -3\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix} + \begin{bmatrix}10\\ 1\\ 0\end{bmatrix} \text{U}$$

Design a state feedback controller which will give closed loop poles at -1$\pm$ 2j, -6.

4 (a) Explain describing function analysis of nonlinear systems.

(b) Find describing function for saturation.

5 Construct phase trajectory by delta method for a non-linear system represented by $\ddot{X}$+ 4 $\left|\dot{X}\right| \dot{X} + 4X = 0$. Choose initial conditions as $X(0) = 1$ and $\dot{X}(0) = 0$.

6 (a) Define the terms stability and asymptotic stability in the sense of Liapunov.

(b) Consider a non-linear system described by the equation

$\dot{X}_1 = X_2$, $\dot{X}_2 = -$ (1- $|X_1|$)X_2 -X_1

Find the region in the state plane for which equilibrium state of the system is asymptotically stable.

7 (a) Explain tracking problem.

(b) Explain state regulator problem.

8 Explain Pontryagin's minimum principle.

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Code: 9A02808

1

B. Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

ENERGY AUDITING & DEMAND SIDE MANAGEMENT

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Explain in detail about how to conserve electrical energy and explain some of the means to conserve energy.

2 Explain briefly about the following:
(a) Energy index
(b) Pie charts

3 Discuss about constructional details of energy efficient motors.

4 Explain in detail about the effect of harmonics on power factor with a suitable example.

5 Write a short notes on the following:
(a) Watt meter
(b) Thermocouples

6 (a) Explain how to develop cash flow models.
(b) Explain the concept of depreciation in energy economic analysis.

7 (a) Define DSM and explain the benefits of DSM.
(b) Explain about the concept of ‘time of day pricing’.

8 (a) Explain in brief about the concept of load management.
(b) Discuss about load priority technique.

*****

Code: 9A02808

2

B. Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

ENERGY AUDITING & DEMAND SIDE MANAGEMENT

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain in detail about the energy situation in world and in India.
(b) Discuss briefly about the electrical energy conservation with suitable examples.

2 Write a short notes on the following:
(a) Cost index
(b) Sankey diagrams

3 (a) Explain about the importance of energy efficient motors.
(b) Explain briefly about some of the performance characteristics of energy efficient motors.

4 (a) Explain the need of power factor improvement with a suitable example.
(b) A 3-Ø, 50 Hz, 400 V motor develops 100 H.P, the power factor being 0.75 lagging and efficiency 93%. A bank of capacitors is connected in delta across the supply terminals and power factor raised to 0.95 lagging. Each of the capacitance units is built of 4 similar 100 V capacitors. Determine the capacitance of each capacitor.

5 Write a short notes on the following:
(a) Lighting energy audit.
(b) Application of PLC's.

6 (a) Explain how to develop cash flow models.
(b) Explain in brief about taxes and tax credit.

7 Explain in detail about the different techniques of DSM with necessary examples.

8 Explain in detail about the following:
(a) Load priority technique.
(b) Strategic conservation.

*****

Code: 9A02808

3

B. Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

ENERGY AUDITING & DEMAND SIDE MANAGEMENT

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Explain in brief about electrical energy consumption and conservation in India and in the world.

2 Explain in detail about energy conservation schemes with necessary examples.

3 Write a short notes on the following:
(a) Voltage unbalance
(b) Motor energy audit

4 (a) Discuss about location of capacitors in power factor improvement.
(b) Explain in detail about the importance of power factor improvement.

5 Explain in brief about the following:
(a) Lighting energy audit
(b) Tongue testers

6 (a) Write a short note on payback analysis.
(b) Explain the concept of depreciation in energy economic analysis.

7 (a) Define DSM and explain the importance of it.
(b) Explain briefly about different techniques of DSM.

8 (a) Define load management and explain its importance.
(b) Discuss in brief about peak clipping and peak shifting.

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Code: 9A02808

4

B. Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

ENERGY AUDITING & DEMAND SIDE MANAGEMENT

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Explain in brief about electrical energy consumption and conservation in India and in the world.

2 Define the term energy audit and briefly explain various types of energy auditing.

3 (a) Explain about the factors affecting the efficiency of motors.
(b) Explain about variable duty cycle systems.

4 Explain in detail about various power factor improvement methods.

5 Write a short notes on the following:
(a) Lighting control
(b) Data loggers
(c) Lux meters

6 Explain in detail about the time value of money concept and payback analysis.

7 (a) Explain the concept of DSM and benefits of it.
(b) Discuss about different techniques of DSM.

8 (a) Explain in detail about load management.
(b) Write a short note on energy efficient equipment.

*****