

MASTER OF POWER ENGINEERING EXAMINATION, 2017

(1ST SEMESTER)

ENERGY PLANNING, MANAGEMENT AND MODELING

Time : Three (3) Hours

Full Marks : 100

Answer any Six(6) Questions. All questions carry equal marks : For neatness-Marks:4

1. a) Indicate which of the following are primary energy & which are secondary. (3)
 - i) Biomass
 - ii) Geothermal energy
 - iii) Natural gas
 - iv) Steam
 - v) Electricity
 - vi) LPG gas
- b) Give a few examples of commercial energy. (2)
- c) Define renewable energy (2)
- d) Discuss a few major provisions of Energy Conservation Act – 2001 (9)

2. a) What is Energy Security ? (2)
- b) List a few strategic measures for meeting future energy requirement of India. (10)
- c) Convert the following into Tonnes of Oil equivalent
 - i) 10000 KG of coal of calorific value of 4000 Kcal / Kg (2)

- ii) 1 Million KWH. (2)
3. a) Name the Green house gases. (2)
- b) What is Global Warming Potential ? (2)
- c) What are the likely impacts of global warming ? (6)
- d) What are the necessary conditions for a project to be qualified as CDM project? (6)
4. a) During April-2013, A plant has recorded a maximum demand of 600 kVA and average PF is observed to be 0.82 lag. The minimum average PF to be maintained is 0.92 lag as per the independent utility supplier and every 1 % dip in PF attracts a penalty of Rs 10,000/- in each month. (4)
- i) Calculate the improvement in PF for May-2013 by installing 100 kVAR capacitor.
- ii) Calculate penalty to be paid ,if any, during May-2013.
- b) Compute the Maximum demand(MD) recorded for a plant where the recorded load is as mentioned below in the recording cycle of 30 minutes. (4)
- 1000 kVA for 5 minutes
 - 200 kVA for 5 minutes
 - 500 kVA for 10 minutes
 - 800 kVA for 8 minutes
 - 1500 kVA for 2 minutes
- c) What are the step by step approach for maximum demand control in electrical systems? (8)
5. a) As an energy auditor, what will be your areas of focus for improving energy efficiency related to lighting? (4)
- b) In a factory, running for 3 shifts, lighting is provided by discharge lamps like blended mercury lamps, sodium vapour lamps and flurocent lamps. The lighting circuit is common with all other electrical loads. Total average lighting load is 1000 KW. (6)

Knowing the fact that reduction in voltage by 5% hardly has any effect on Illumination level, whereas power saving can be effected by 10%; You decided to segregate lighting load from other load and proposed to install one Automatic Voltage regulator in the lighting circuit.

The cost of the Automatic Voltage regulator and segregation of Circuit is Rs. 35 lakhs. Energy cost is Rs. 4/- per unit.

Is your decision right?

- c) A 22 KW motor was driving a cooling water pump. The motor was loaded (6) only 30%. You, as energy auditor, decided to connect the delta connected motor to star. The measurements, before and after such conversion, is given below :

Parameter	Before Conversion	After Conversion
Voltage (V)	415	415
Current (A)	18.5	9.5
Power Factor	0.5	0.87
Power Input (KW)	6.72	5.96
Speed (RPM)	1469	1454

Investment for such conversion was Rs. 20,000/-.

Cost of Energy is Rs. 4/- per unit.

Was your decision right ?

6. a) With NPV value analysis, evaluate financial merit of the 2 projects shown in the table. Rate of bank interest is 9%. (6)

	<u>Project-1</u>	<u>Project-2</u>
Capital Cost	2,50,000/-	2,50,000/-
Net Annual Saving		
1 st Year	70,000/-	60,000/-
2 nd Year	65,000/-	65,000/-
3 rd Year	60,000/-	70,000/-
4 th Year	60,000/-	75,000/-
5 th Year	60,000/-	80,000/-

6th Year

55,000/-

85,000/-

- b) What will be the IRR of the selected project ? (6)
- c) What are the deficiencies of "Pay back Method" for taking a decision for launching a project ? (4)
7. a) Why is it beneficial to operate motors in star mode for under- loaded motors ? (4)
- b) What are the specialties of an energy efficient motor? (8)
- c) List the losses in induction motor and their expected percentage out of total losses. (4)
8. a) What are the power and function of Bureau of Energy Efficiency (BEE), as per EC Act 2001 ? Name a few. (8)
- b) Write short notes on :
- i) Energy Conservation Building Codes (4)
- ii) Standards & Labelling(as per BEE) (4)
9. a) What is utility of energy modeling ? (3)
- b) What are different energy models employed ? (3)
- c) Indicate various econometric models to estimate the the future energy demand (4)
- d) Suggest an appropriate model to estimate future energy demand in India (2)
- c) Name the types of problem where linear programming will be an useful solution tool and where geometric programming will be an useful solution tool. (4)