**SAMPLE QUESTION BANK**

**Program: BE (Mechanical Engineering)**

Curriculum Scheme: **Rev 2016**

**BE Semester VIII**

Course Code:MEDLOC8044 and Course Name: Energy Management in Utility System

=====================================================================

**MCQ- SAMPLE SET**

|  |  |
| --- | --- |
| 1. | Which of the following statement is true regarding the EC act? |
| Option A: | Designated consumer has to get an energy audit by a accredited Energy Auditor |
| Option B: | State Designated Agencies have to appoint Energy auditor with prescribed qualifications. |
| Option C: | Designated consumer has to get an energy audit by a Certified Energy Manager |
| Option D: | Designated consumer has to get an energy audit conducted by the State Designated Agency |
|  |  |
| 2. | The main purpose of BEE is to |
| Option A: | carry actual energy audit |
| Option B: | frame the policies for energy conservation and ensures its effective implementation in India |
| Option C: | sell energy efficient product |
| Option D: | Monitor energy consumption of all industries on daily basic |
|  |  |
| 3. | If 10000 kg salt solution with 3.5% concentration is be converted to 7% concentration, the water evaporation will be |
| Option A: | 2000 kg |
| Option B: | 5000kg |
| Option C: | 3000 kg |
| Option D: | 3500 kg |
|  |  |
| 4. | Luxmeter is used for |
| Option A: | Lighting level measurement |
| Option B: | Flow measurement |
| Option C: | Velocity measurement |
| Option D: | Temperature measurement |
|  |  |
| 5. | Estimate simple payback period if 10 kW motor replaced with 6 kW efficient motor. Assumed 5000 h/year operation duration, 10 Rs/kWh, cost of motor Rs. 100000/- |
| Option A: | 6 months |
| Option B: | 8 months |
| Option C: | 12 months |
| Option D: | 24 months |
|  |  |
| 6. | If operating 5 kW pump in night time, have benefit of lower tarrif by 0.5 Rs/kWh, the reduction in monthly bill for its 5 h/day running will be |
| Option A: | Rs. 270 |
| Option B: | Rs. 500 |
| Option C: | Rs. 375 |
| Option D: | Rs. 425 |
|  |  |
| 7. | The pump was used to circulate cooling water from and to cooling tower. The height difference between cooling tower inlet and pump centre line is 5 m, the minimum pressure at pump outlet shall be |
| Option A: | 0.5 bar (g) |
| Option B: | 0.4 bar (g) |
| Option C: | 0.3 bar (g) |
| Option D: | 0.2 bar (g) |
|  |  |
| 8. | Steam traps are used for |
| Option A: | To allow condensate to flow and trap the steam |
| Option B: | Stop heat loss from system |
| Option C: | Allow excess steam to flow |
| Option D: | To maintain pressure in steam pipe |
|  |  |
| 9. | In cogeneration |
| Option A: | High pressure steam is expanded through turbine and expanded steam is used for process |
| Option B: | High pressure steam is expanded through turbine and expanded steam is condensed |
| Option C: | Higher pressure steam is used for refrigeration |
| Option D: | Electricity is used for steam generation and steam is used for process |
|  |  |
| 10. | An induction motor draws 8 kW with a lagging reactive power of 4 kVAr. Calculate the operating power factor of the motor. |
| Option A: | 0.65 to 0.75 |
| Option B: | 0.75 to 0.85 |
| Option C: | 0.85 to 0.95 |
| Option D: | 0.95 to 1.00 |
|  |  |
| 11. | A process requires 120 kg of fuel with a calorific value of 4800 kcal/kg for heating with a system efficiency of 82 %. The loss would be . |
| Option A: | 576000kcal |
| Option B: | 472320kcal |
| Option C: | 103680kcal |
| Option D: | 480000kcal |
|  |  |
| 12. | Anemometer meter is used for |
| Option A: | Lighting level measurement |
| Option B: | CO2 measurement |
| Option C: | Velocity measurement |
| Option D: | Temperature measurement |
|  |  |
| 13. | Which of the following has the lowest energy content in terms of MJ/kg? |
| Option A: | LPG |
| Option B: | Diesel |
| Option C: | Natural Gas |
| Option D: | Coal |
|  |  |
| 14. | If higher pressure water from pipe is expanded to atmosphere pressure |
| Option A: | It cools and evaporate |
| Option B: | Its temperature increases |
| Option C: | All water converted to steam |
| Option D: | It gets subcool |
|  |  |
| 15. | The pump was used to circulate cooling water across cooling tower. The height difference between cooling tower inlet and pump centre line is 7 m and pressure drop across system is 3 m, the minimum pressure at pump outlet shall be |
| Option A: | 0.5 bar (g) |
| Option B: | 1 bar (g) |
| Option C: | 0.3 bar (g) |
| Option D: | 0.2 bar (g) |
|  |  |
| 16. | The lower approach in cooling tower |
| Option A: | Increases refrigerant condensation pressure |
| Option B: | Decreases refrigerant condensation pressure |
| Option C: | Increases compressor power |
| Option D: | Decreases cooling capacity |
|  |  |
| 17. | The replacement of CFL with LED reduce the power consumption by |
| Option A: | 10 to 20% |
| Option B: | 20 to 30% |
| Option C: | 40 to 50% |
| Option D: | 60 to 80% |
|  |  |
| 18. | Which of the following is not an environmental issue of global significance |
| Option A: | Ozone layer depletion |
| Option B: | Global Warning |
| Option C: | Loss of Biodiversity |
| Option D: | Suspended particulate Matter |
|  |  |
| 19. | The unit of lumen efficacy |
| Option A: | lm/W |
| Option B: | W/m2 |
| Option C: | lux/W.m2 |
| Option D: | W/m2/100lux |
|  |  |
| 20. | In a glass industry waste heat is used for power generation. This type of cogeneration |
| Option A: | topping cycle |
| Option B: | bottoming cycle |
| Option C: | gas turbine cycle |
| Option D: | reheat cycle |
|  |  |
| 21. | The isentropic enthalpy drop of 2TPH steam across turbine was 50 kJ/kg. If is isentropic efficiency was 50% , the power generation will be |
| Option A: | 13.88 kW |
| Option B: | 50 kW |
| Option C: | 55.55 kW |
| Option D: | 27.77 kW |
|  |  |
| 22. | The calorific value of oil is 10000 kCal/ kg. Find out the coal equivalent to replace 1 kg of oil (Coal GCV = 16000 kJ/kg) assuming same efficiency |
| Option A: | 0.625 kg |
| Option B: | 3 kg |
| Option C: | 2.6 kg |
| Option D: | 3.56 kg |

**Descriptive SAMPLE SET**

|  |  |
| --- | --- |
| Q1. | How much carbon emission will be reduced per year by replacing 60 Watt incandescent lamp with 15 Watt CFL Lamp, if emission per unit is 1 kg CO2 per kWh and annual burning is 3000 hours? |
| Q2. | The cost of replacement of inefficient pump with an efficient pump in a plant was Rs 5 lakh. The net annual cash flow is Rs 1.5 lakh. Calculate return on investment. |
| Q3. | If power factor is to be increase from 0.6 to 0.95 for 20 kW load, calculate size of capacitor bank and annual saving, if demand charges are 200 Rs/kVA. |
| Q4. | The monthly unit consumption of a continuously running plant was 50000, and its contract demand 250 kVA. Estimate saving potential. |
| Q5. | Coal fired boiler consumes 200 kg/h fuel and generates saturated steam @ 7 bar (g). The water consumption during test of 7 hr was 5600 kg. Assume saturation enthalpy of steam at 7 bar as 2400 kJ/kg, calculate direct efficiency of boiler and evaporation rate. |
| Q6. | Moisture content of 25 kg/h dry cloth is reduced from 65% to 15% over stenter. If condensate collection rate from it was 20 kg/h, find efficiency of drier. (steam entering dry and saturated at 7 bar (g)) |
| Q7. | A commercial building uses 60 W capacity 100 CFL bulbs. If 50% can be replaced with natural light and 50% on 30 W LED light, estimate annual saving potential. Assume annual burning is 3000 hours, electricity rate as 15 Rs/kWh? |
| Q8. | Steam leakage from faulty steam trap was 85 kg/h. Estimate annual loss. (assume evaporation ratio at boiler : 12, fuel rate 50 Rs/kg) |
| Q9. | If power factor is to be increase from 0.7 to 0.95 for 20 kW load, calculate size of capacitor bank and annual potential saving, if demand charges are 200 Rs/kVA. |
| Q10. | Explain energy audit process across fans and blower. |
| Q11. | Moisture content of 30 kg/h dry cloth is reduced from 65% to 15% over stenter. If condensate collection rate from it was 20 kg/h, find efficiency of drier. (steam entering dry and saturated at 7 bar (g)) |
| Q12. | The cost of replacement of inefficient compressor with an energy efficient compressor in a plant was Rs 5 lakh. The net annual cash flow is Rs 1.25 lakh. Calculate return on investment. |
| Q13. | A plant required steam at 4 TPH at 3 bar, and power 450 kW power. Suggest suitable energy saving scheme with approximate operating parameters. |
| Q14. | In a boiler operating with 10:1 fuel air ration & with 1 TPH coal consumption, flue gas were available at 300oC. If flue gas temperature can be reduced to 200oC for water preheating, estimate annual saving (Assume cost of fuel : 5 Rs/kg, CV: 10000 kJ/kg, efficiency of boiler : 65%) |
| Q15. | If doubling the water flow rate reduces condenser temperature if 200 TR chiller and increases its COP from 2.8 to 3.3, estimate annual saving in electricity bill, if earlier pump power was 2.6 kW and electricity was available at Rs 10 per kWh. |
| Q16. | If power factor is to be increase from 0.7 to 0.99 for 20 kW load, calculate size of capacitor bank and annual saving, if demand charges are 250 Rs/kVA. |
| Q17. | A plant required heating load of evaporating 5000 kg/h water and also power 400 kW power. Suggest suitable energy saving scheme with approximate operating parameters. |
| Q18. | The cost of replacement of inefficient compressor with an energy efficient compressor in a plant was Rs 6 lakh. The net annual cash flow is Rs 1.5 lakh. Calculate return on investment. |
| Q19. | How much carbon emission will be reduced per year by replacing 15 Watt CFL lamp with 7 Watt LED Lamp, if emission per unit is 1 kg CO2 per kWh and annual burning is 3000 hours? |
| Q20. | In a boiler operating with 12:1 fuel air ration & with 1.5 TPH coal consumption, flue gas were available at 250oC. If flue gas temperature can be reduced to 150oC for water preheating, estimate annual saving (Assume cost of fuel: 6 Rs/kg, CV: 10000 kJ/kg, efficiency of boiler: 65%) |
| Q21. | The revamping of cooling tower reduces approach by 2K. Assume suitable parameters and show its effect on COP of chiller on P-h diagram. |
| Q22. | If doubling the water flow rate across condenser of 200 TR chiller increases its COP from 2.8 to 3.3, estimate annual saving in electricity bill and reduction in cooling tower load. Assume earlier pump power consumption was 2.6 kW and electricity was available at Rs 10 Rs/kWh. (assume suitable parameters such as pump efficiency) |
| Q23. | A plant uses electrical heater of 200 kW for a machine. It was suggested to install Thermic oil heater and uses its oil for heating the machine. Estimate the saving potential if Thermic oil heater operates on either FO or briquette fuel. Draw schematic of suggested scheme and suggest suitable fuel. Assume electricity is available @ 9 Rs/kWh. Assume suitable parameters.   |  |  |  |  | | --- | --- | --- | --- | | Fuel | Cost, Rs/kg | Calorific Value, kJ/kg | Operating efficiency, % | | Briquette | 7.0 | 16000 | 65 | | FO | 45 | 44000 | 85 | |
| Q24 | Calculate NPV of the following two projects and reason on which project is more attractive. Assume discount rate of 14%   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Year | 0 | 1 | 2 | 3 | 4 | | Project P | (225,000) | 25,000 | 75,000 | 100,000 | 150,000 | | Project Q | (225,000) | 61,000 | 88,000 | 95,000 | 29,000 | |
| Q25. | If doubling the water flow rate across condenser of 200 TR chiller increases its COP from 2.8 to 3.3, estimate annual saving in electricity bill and reduction in cooling tower load. Assume earlier pump power consumption was 2.6 kW and electricity was available at Rs 10 Rs/kWh. (assume suitable parameters such as pump efficiency) |
| Q26. | A plant uses electrical heater of 300 kW for a machine. It was suggested to install Thermic oil heater and uses its oil for heating the machine. Estimate the saving potential if Thermic oil heater operates on either FO or briquette fuel. Draw schematic of suggested scheme and suggest suitable fuel. Assume electricity is available @ 9 Rs/kWh. Assume suitable parameters.   |  |  |  |  | | --- | --- | --- | --- | | Fuel | Cost, Rs/kg | Calorific Value, kJ/kg | Operating efficiency, % | | Briquette | 7.5 | 16000 | 65 | | FO | 45 | 44000 | 85 | |
| Q27. | The specific power consumption of 200 TR water cooled chiller was 0.9 kW/TR. Estimate the thermal load in cooling tower. |
| Q28. | If 100 CFL of 50 W working 12 h/day are to be replaced with 20 W LED, estimate reduction in annual electricity consumption and bill if electricity charges were 5 Rs/kWh. |
| Q29. | Explain energy audit methodology in details. |
| Q30. | Explain CDM and carbon credit with suitable example |
| Q31. | If COP of 2 TR air conditioner is improved from 2.5 to 3.517, estimate reduction electrical unit consumption for 10 hours/day of continuous operation. |
| Q32. | The COP of 200 TR chillers was 3.2. Estimate the thermal load in cooling tower and water evaporation rate from cooling tower, if latent heat of water was 2500 kJ/kg |
| Q33. | A 300 kg/h condensate is available at 90oC. If boiler uses fuel having CV as 10000 kJ/kg, and operates at 70% efficiency, estimate saving in fuel consumption, if raw water is available at 27oC. |
| Q34. | Explain any three electrical energy billing system. |
| Q35. | A plant’s requires steam at 3 kg/cm2 uses FO fuel based boiler. If its monthly FO consumption and electricity consumption were 150 kl and 3 lac units, suggest suitable cogeneration schemes with assumed operating parameter, saving potential. |
| Q36. | The operating parameters of boiler are flue temperature at chimney base: 300oC. A:F ratio:12:1 fuel air ratio, Coal consumption: 1000 kg/h. If flue gas temperature can be reduced to 200oC for water preheating from 40oC to 90oC, estimate the heat transfer area of water preheater and annual saving (Assume cost of fuel : 10 Rs/kg, CV: 16000 kJ/kg, efficiency of boiler : 65%, overall heat transfer coefficient : 30 W/m2K) |
| Q37. | Explain the procedure of conducting energy audit across an air compressor, with suitable schematic. If loading and unloading time of compressor is 30:70. Suggest suitable energy measures. |
| Q38. | The flue gas temperature at chimney inlet for 5 TPH boiler is 250oC. If this can be reduced to 160oC, using air preheater, estimate saving potential and area of heat exchanger. Assumed following parameters   1. Efficiency of boiler: 70% 2. Calorific value of fuel : 12000 kJ/kg 3. Air fuel ratio : 12 4. Overall heat transfer coefficient of air preheater : 15 W/m2K 5. Inlet and outlet air temperature : 90 and 180oC 6. Specific heat of air : 1 kJ/kg.K   Rate of fuel: 6 Rs/kg |
| Q39. | Pump is connected to heat exchanger placed at 16 m height and have pressure drop of 0.4 kg/cm2. If delivery pressure gauge shows 3.5 kg/cm2, apply suitable techniques for energy saving. |