# 18EE23/ Module 5

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| Estimate total daily cost of energy for the following loads of the consumer.   |  |  |  |  | | --- | --- | --- | --- | | Name of the appliance | Power Rating  (W) | Avg. Daily Usage Hours | No. of Appliances | | Tube Light | 40 | 8 | 2 | | TV | 175 | 5 | 1 | | Fan | 50 | 10 | 3 | | Computer | 250 | 3 | 1 | | AC | 1200 | 3 | 1 |   The electricity cost is Rs.5 per unit.  Total Energy Consumption is 7365 Wh  Total Daily cost= 7.36 Units \* 5 Rs = Rs 36.8 per day consumption  An electrical installation consists of 13 light points of 80 W each, 5 light points of 50 W lamp, 6 fans of 100 W capacity and a pump motor of 1 HP. Assuming that 45% of light and fans are used for 6 hours per day and that the water pump works for 2 hours daily. Find out the monthly consumption and cost of electricity bill, based on the tariff of 3 Rs per KWh.  Light and fans Energy consumption = 5103 Wh  Motor= 746\*2hours= 1492 Wh  Total Energy Consumption per day = 6595 Wh  Monthly Energy Consumption : 6595\*30 = 198 Units  Monthly Electricity Bill at the rate of 3 Rs per unit is = 198Units \* 3Rs= 594Rs |

| Calculate the total bill amount of a house for 30 days if 4 bulbs of 50W for 6 hours, 3 tube lights of 40W for 12 hours, a TV of 100W for 5 hours, a refrigerator of 300W for 24 hours are used. The cost per unit is Rs.4  Total Energy Consumption per day = 10340 Wh  Per month = 310 Units  Total Monthly bill at the rate of 4 Rs per unit: Rs 1240  An electrical installation comprises 9 light points of 80 W each, 6 light points of 50 W lamp, 6 fans of 80 W capacity and a pump motor of 1 HP. Assuming that 60% of light and fans are used for 6 hours per day and that the water pump works for 2 hours daily. Find out the monthly consumption and cost of electricity bill, based on the tariff of 3.5 Rs per KWh.  Light and fans Energy consumption = 5400 Wh  Motor= 746\*2hours= 1492 Wh  Total Energy Consumption per day = 6892 Wh  Monthly Energy Consumption: 6892\*30 = 207 Units  Monthly Electricity Bill at the rate of 3.5 Rs per unit is = 207 units \* 3Rs= 725Rs |
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## Question 03 (ES)

| A household uses the following electric appliances:   1. Refrigerator of rating 400 W for 24 hours each day. 2. Two electric fans of rating 80 W each for 12 hours each day. 3. Six electric bulbs of 18 W each for 6 hours each day.   Calculate the electricity bill of the household for the month of June if the cost per unit of electric energy is Rs.3.00.  Refrigerator energy consumption = 9600 Wh  Fan = 1920 Wh  Bulbs = 648 Wh  Total Energy consumption = 12168 Wh  Monthly Energy consumption = 365.04 units  Monthly Electricity Bill = Rs. 1095.12  An electrical installation consists of 12 light points of 80 W each, 10 light points of 50 W lamp, 2 fans of 100 W capacity and a pump motor of 1.5 HP. Assuming that 40% of light and fans are used for 5 hours per day and that the water pump works for 2 hours daily. Find out the monthly consumption and cost of electricity bill, based on the tariff of 4.5 Rs per KWh.  Light and fans Energy consumption = 3320 Wh  Motor= 746\*2hours= 2238 Wh  Total Energy Consumption per day = 5558 Wh  Monthly Energy Consumption: 5558\*30 = 167 Units  Monthly Electricity Bill at the rate of 3.5 Rs per unit is = 167 units \* 4.5 Rs= 752 Rs |
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## Question 04 (ES)

| A geyser is rated at 4kW, 230V, 50Hz. If it is switched ON for 50 minutes daily, what would be the energy cost saving, at the rate of Rs.3 per unit if it is replaced by a solar water heater?  Energy consumed per month = 100 units  Cost of energy per month = Rs. 300  Monthly Savings = Rs. 300  An electrical installation consists of 14 light points of 100 W each, 7 light points of 50 W lamp, 8 fans of 80 W capacity and a pump motor of 1.5 HP. Assuming that 70% of light and fans are used for 5 hours per day and that the water pump works for 3 hours daily. Find out the monthly consumption and cost of electricity bill, based on the tariff of 3 Rs per KWh.  Light and fans Energy consumption = 8365 Wh  Motor= 746\*1.5\*hours= 3357 Wh  Total Energy Consumption per day = 11722 Wh  Monthly Energy Consumption: 11722\*30 = 352 Units  Monthly Electricity Bill at the rate of 3 Rs per unit is = 352 units \* 3 Rs= 1056 Rs |
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## Question 05 (ES)

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| Calculate the total daily Energy requirement for the following loads   |  |  |  |  | | --- | --- | --- | --- | | Name of the appliance | Power Rating  (W) | Avg. Daily Usage Hours | No. of Appliances | | Tube Light | 50 | 6 | 3 | | TV | 150 | 3 | 2 | | Fan | 40 | 8 | 2 | | Computer | 300 | 1 | 1 | | AC | 1000 | 4 | 1 |   The electricity cost is Rs.6 per unit for the first 20 units, Rs.4 per  unit for the next 30 units and Rs.2 per unit for usage above this.  Tube Light energy consumption = 900 Wh  TV = 900 Wh  Fan = 640 Wh  Computer = 300 Wh  AC = 4000 Wh  Total Energy consumption = 6740 Wh  Monthly Energy consumption = 202.2 units  Monthly Electricity Bill = Rs. 544.4  An electrical installation consists of 18 light points of 80 W each, 6 light points of 50 W lamp, 5 fans of 100 W capacity and a pump motor of 2 HP. Assuming that 55% of light and fans are used for 5 hours per day and that the water pump works for 2 hours daily. Find out the monthly consumption and cost of electricity bill, based on the tariff of 5 Rs per KWh.  Light and fans Energy consumption = 6160 Wh  Motor= 746\*2\*2 hours= 2984 Wh  Total Energy Consumption per day = 9144 Wh  Monthly Energy Consumption: 9144\*30 = 275 Units  Monthly Electricity Bill at the rate of 5 Rs per unit is = 275 units \* 5 Rs= 1375 Rs |

## Question 06 (ES)

| Estimate Total cost of daily Energy requirement for the following loads    Take electricity cost to be Rs.6 per unit.  CFL energy consumption = 216 Wh  Fan = 800 Wh  TV = 300 Wh  Computer = 750 Wh  Total Energy consumption = 2066 Wh  Monthly Energy consumption = 61.98 units  Monthly Electricity Bill = Rs. 371.88  Estimate the monthly electricity bill for the subsequent load fitted in an electrical installation.  (a) 15 lamps 50 watts each working 4 hours/ day.  (b) 4 ceiling fans 100 watts each working 8 hours/day.  (c) 2 kw heater working 2 hours/day.  (d) Water pump of 0.5 HP runs for 2 hours per day  Rate of charges for light and fans is 3.5 Rs / unit and heater and motor 4 Rs/unit.  Lamp load= 15 lamps \* 50watts \* 4hrs = 3000Wh  Fan load= 4 Fans \* 100 watts \* 8hrs= 3200Wh  Energy Consumption due to lights and Fans per day= 6200 Wh  Therefore, per month Energy consumption due to lights and Fans= 186 Units  **Rate of charges for light and fans= 186 Units \* 3.5 Rs= Rs 651**  Other Loads per month energy Consumption = (2kw \* 2hrs+746\*0.5HP\*2 hrs)\*30=143 Units  **Rate of charges for Heater and Water pump = 143 Units \* 4 Rs= Rs 572**  Total monthly Electricity bill= Rs 651+ Rs 572 = Rs 1223 |
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## Question 07 (ES)

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| A house using electrical tools as listed in the following table   |  |  |  |  | | --- | --- | --- | --- | | SI.No | TOOLS | AMOUNT | TIME OF USE | | 1 | LAMP 10Watt | 4 | 10hours/day | | 2 | TV 100Watt | 1 | 10hours/day | | 3 | CLOTHES IRON 300Watt | 1 | 2hours/day |   How much electrical energy is used for 1 month (30 days)?  Lamp energy consumption = 400 Wh  TV = 1000 Wh  Clothes Iron = 600 Wh  Total Energy consumption = 2000 Wh  Monthly Energy consumption = 60 units  Determine the monthly electricity bill for the following load fitted in an electrical installation.  (a) 12 lamps 50 watts each working 8 hours/ day.  (b) 10 ceiling fans 80 watts each working 5 hours/day.  (c) 3 kw heater working 1 hours/day.  (d) Water pump of 1 HP runs for 1 hours per day  Rate of charges for light and fans is 3 Rs / unit and heater and motor 4 Rs/unit.  Lamp load= 12 lamps \* 50watts \* 8hrs = 4800Wh  Fan load= 10 Fans \* 80 watts \* 5 hrs= 4000 Wh  Energy Consumption due to lights and Fans per day= 8800 Wh  Therefore, per month Energy consumption due to lights and Fans= 264 Units  **Rate of charges for light and fans= 264 Units \* 3 Rs= Rs 792**  Other Loads per month energy Consumption = (3kw \* 1hrs+746\*1HP\*1 hrs)\*30=113Units  **Rate of charges for Heater and Water pump = 113 Units \* 4 Rs= Rs 452**  Total monthly Electricity bill= Rs 792+ Rs 452 = Rs 1244 |

## Question 08 (ES)

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| A domestic consumer has 10 number of lamps of 60 watts each, connected in his house. His demand is given as follows:  Midnight to 5am ………..50 watt  5 am to 6 pm …………....no-load  6pm to 7 pm ……………390watt  7pm to 9pm …………….340watt  9pm to 12 midnight …….190watt  Plot the load curve,  Determine: i) Average load ii) Maximum load iii) load factor iv) Energy consumption during one day.  Avg Load. = 78.75 W  Max Load = 390 W  Load Factor = Avg load/Max load = 20.19%  Energy consumed daily = 1890 W  Estimate total daily cost of energy for the following loads of the consumer.   |  |  |  |  | | --- | --- | --- | --- | | Name of the appliance | Power Rating  (W) | Avg. Daily Usage Hours | No. of Appliances | | Tube Light | 40 | 8 | 2 | | TV | 175 | 5 | 1 | | Fan | 50 | 10 | 3 | | Computer | 250 | 3 | 1 | | AC | 1200 | 3 | 1 |   The electricity cost is Rs.5 per unit.  Total Energy Consumption is 7365 Wh  Total Daily cost= 7.36 Units \* 5 Rs = Rs 36.8 per day consumption |

## Question 09 (ES)

| In a house, there are 5 lamps of 25 Watt used 14 hours per day, a 200-Watt refrigerator used 24 hours per day, and a 125-Watt water pump used 8 hours per day. How much electrical energy used for a month (30 days)?  Lamp energy consumption = 1750 Wh  Refrigerator = 4800 Wh  Pump = 1000 Wh  Total Energy consumption = 7550 Wh  Monthly Energy consumption = 226.5 units  Calculate the total bill amount of a house for 30 days if 4 bulbs of 50W for 6 hours, 3 tube lights of 40W for 12 hours, a TV of 100W for 5 hours, a refrigerator of 300W for 24 hours are used. The cost per unit is Rs.4.  Total Energy Consumption per day = 10340 Wh  Per month = 310 Units  Total Monthly bill at the rate of 4 Rs per unit: Rs 1240 |
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| Question 10 (ES)  Estimate the total daily energy requirement for the following loads.   |  |  |  |  | | --- | --- | --- | --- | | Name of the appliance | Power Rating | Average daily usage  (Hrs) | No of appliance | | TV | 150 | 3 | 1 | | Water Pump | 500 | 10 | 1 | | Refrigerator | 500 | 17 | 1 | | Dishwasher (with electric water heater) | 1500 | 8 | 2 | | Electric Heater (Portable) | 1200 | 5 | 2 |   Take electricity cost to be Rs. 8 per unit.  TV energy consumption = 450 Wh  Pump = 5000 Wh  Refrigerator = 8500 Wh  Dishwasher = 24000 Wh  Heater = 12000 Wh  Total Energy consumption = 49950 Wh  Monthly Energy consumption = 1498.50 units  Monthly Electricity Bill = Rs. 11988  A household uses the following electric appliances:   1. Refrigerator of rating 400 W for 24 hours each day. 2. Two electric fans of rating 80 W each for 12 hours each day. 3. Six electric bulbs of 18 W each for 6 hours each day.   Calculate the electricity bill of the household for the month of June if the cost per unit of electric energy is Rs.3.00.  Refrigerator energy consumption = 9600 Wh  Fan = 1920 Wh  Bulbs = 648 Wh  Total Energy consumption = 12168 Wh  Monthly Energy consumption = 365.04 units  Monthly Electricity Bill = Rs. 1095.12 |

## Question 11 (ES)

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| Find the total cost of daily energy consumed for the following loads.   |  |  |  |  | | --- | --- | --- | --- | | Name of the appliance | Power Rating | Avg daily usage  (Hrs) | No of appliance | | Vacuum Cleaner (Portable) | 800 | 2 | 1 | | Water Bed Heater | 3800 | 8 | 2 | | Fan (Portable) | 115 | 18 | 3 | | Coffee Maker | 900 | 4 | 2 | | Clock | 10 | 24 | 2 |   Take electricity cost to be Rs. 10 per unit.  Vaccum cleaner energy consumption = 1600 Wh  Water Bed Heater = 60800 Wh  Fan = 6210 Wh  Coffee Maker = 7200 Wh  Clock = 480 Wh  Total Energy consumption = 76290 Wh  Monthly Energy consumption = 2288.7 units  Monthly Electricity Bill = Rs. 22,887  A geyser is rated at 4kW, 230V, 50Hz. If it is switched ON for 50 minutes daily, what would be the energy cost saving, at the rate of Rs.3 per unit if it is replaced by a solar water heater?  Energy consumed per month = 100 units  Cost of energy per month = Rs. 300  Monthly Savings = Rs. 300 |

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## Question 12 (ES)

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| Calculate the total daily Energy requirement for the following loads   |  |  |  |  | | --- | --- | --- | --- | | Name of the appliance | Power Rating  (W) | Avg. Daily Usage Hours | No. of Appliances | | Tube Light | 50 | 6 | 3 | | TV | 150 | 3 | 2 | | Fan | 40 | 8 | 2 | | Computer | 300 | 1 | 1 | | AC | 1000 | 4 | 1 |   The electricity cost is Rs.6 per unit for the first 20 units, Rs.4 per unit for the next 30 units and Rs.2 per unit for usage above this.  Tube Light energy consumption = 900 Wh  TV = 900 Wh  Fan = 640 Wh  Computer = 300 Wh  AC = 4000 Wh  Total Energy consumption = 6740 Wh  Monthly Energy consumption = 202.2 units  Monthly Electricity Bill = Rs. 544.4  Estimate Total cost of daily Energy requirement for the following loads    Take electricity cost to be Rs.6 per unit. |

## Question 13(ES)

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| A house using electrical tools as listed in the following table   |  |  |  |  | | --- | --- | --- | --- | | SI.No | TOOLS | AMOUNT | TIME OF USE | | 1 | LAMP 10Watt | 4 | 10hours/day | | 2 | TV 100 Watt | 1 | 10hours/day | | 3 | CLOTHES IRON 300Watt | 1 | 2hours/day |   How much electrical energy is used for 1 month (30 days)?  Lamp energy consumption = 400 Wh  TV = 1000 Wh  Clothes Iron = 600 Wh  Total Energy consumption = 2000 Wh  Monthly Energy consumption = 60 units  A domestic consumer has 10 number of lamps of 60 watts each, connected in his house. His demand is given as follows:  Midnight to 5am ………..50 watt  5 am to 6 pm …………....no-load  6pm to 7 pm ……………390watt  7pm to 9pm …………….340watt  9pm to 12 midnight …….190watt  Plot the load curve,  Determine: i) average load ii) maximum load iii) load factor iv) energy consumption during one day.  Avg Load. = 78.75 W  Max Load = 390 W  Load Factor = Avg load/Max load = 20.19%  Energy consumed daily = 1890 W |

## Question 14 (ES)

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| In a house, there are 5 lamps of 25 Watt used 14 hours per day, a 200 Watt refrigerator used 24 hours per day, and a 125 Watt water pump used 8 hours per day. How much electrical energy used for a month (30 days)?  Lamp energy consumption = 1750 Wh  Refrigerator = 4800 Wh  Pump = 1000 Wh  Total Energy consumption = 7550 Wh  Monthly Energy consumption = 226.5 units  Estimate the total daily energy requirement for the following loads.   |  |  |  |  | | --- | --- | --- | --- | | Name of the appliance | Power Rating | Average daily usage  (Hrs) | No of appliance | | TV | 150 | 3 | 1 | | Water Pump | 500 | 10 | 1 | | Refrigerator | 500 | 17 | 1 | | Dishwasher (with electric water heater) | 1500 | 8 | 2 | | Electric Heater (Portable) | 1200 | 5 | 2 |   Take electricity cost to be Rs. 8 per unit.  TV energy consumption = 450 Wh  Pump = 5000 Wh  Refrigerator = 8500 Wh  Dishwasher = 24000 Wh  Heater = 12000 Wh  Total Energy consumption = 49950 Wh  Monthly Energy consumption = 1498.50 units  Monthly Electricity Bill = Rs. 11988 |

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| Question 15 (ES)  Find the total cost of daily energy consumed for the following loads.   |  |  |  |  | | --- | --- | --- | --- | | Name of the appliance | Power Rating | Avg daily usage  (Hrs) | No of appliance | | Vacuum Cleaner (Portable) | 800 | 2 | 1 | | Fan (Portable) | 115 | 18 | 3 | | Coffee Maker | 900 | 4 | 2 | | Clock | 10 | 24 | 2 |   Take electricity cost to be Rs. 10 per unit.  Vaccum cleaner energy consumption = 1600 Wh  Water Bed Heater = 60800 Wh  Fan = 6210 Wh  Coffee Maker = 7200 Wh  Clock = 480 Wh  Total Energy consumption = 76290 Wh  Monthly Energy consumption = 2288.7 units  Monthly Electricity Bill = Rs. 22,887  Calculate the monthly electricity bill for the following load fitted in an electrical installation.  (a) 12 lamps 60 watts each working 8 hours/ day.  (b) 5 ceiling fans 100 watts each working 8 hours/day.  (c) 4 kw heater working 4 hours/day.  (d) Water pump of 0.5 HP runs for 3 hours per day  Rate of charges for light and fans is 3.5 Rs / unit and heater and motor 4 Rs/unit.  Lamp load= 12 lamps \* 60watts \* 8hrs = 5760 Wh  Fan load= 5 Fans \* 100 watts \* 8 hrs= 4000 Wh  Energy Consumption due to lights and Fans per day= 9760 Wh  Therefore, per month Energy consumption due to lights and Fans= 293 Units  **Rate of charges for light and fans= 264 Units \* 3.5 Rs= Rs 1026**  Other Loads per month energy Consumption = (4kw \* 4hrs+746\*0.5HP\*3 hrs)\*30=514 Units  **Rate of charges for Heater and Water pump = 514 Units \* 4 Rs= Rs 2056**  Total monthly Electricity bill= Rs 1026+ Rs 2056 = Rs 3082 |