

QUESTIONNAIRE REPORT SHEET

iPQ2CEM.V1.1

iPQ.No	Correct Answer	Points	Explanation
2CEM001	1	10	<p>Answer = 1</p> $q = LPS \times 1.2 \times \Delta T = q = 1.000 \times 1.2 \times (15 - 10) = 6 \text{ kW}$
2CEM002	2	10	<p>Answer = 2</p> $q = LPS \times 4.2 \times \Delta T = q = 0.04 \times 4.2 \times (6) = 1 \text{ kW}$
2CEM003	3	8	<p>Answer = 3</p> <p>Both</p>
2CEM004	3	10	<p>Answer = 3</p> $(3.6 / EER) = (1 / COP)$ $COP = EER / 3.6 = 10.8 / 3.6 = 3$
2CEM005	2	8	<p>Answer = 2</p> <p>A reheat system is one of several types of heating, ventilation, and air-conditioning (HVAC) systems found in commercial buildings. The primary advantage of a reheat system is that it can provide relatively precise control of space temperature and humidity.</p>
2CEM006	1	8	<p>Answer = 1</p> <p>No, "ReCommissioning" would be the more accurate term.</p>
2CEM007	1	10	<p>Answer = 1</p> $(kWe / kW_{thermal}) = 3.6 / EER = 3.6 / 14.4 = 0.25$
2CEM008	1	10	<p>Answer = 1</p> $(kWe / kW_{thermal}) = 3.6 / EER = 1 / COP$ <p>First, we need to transform the thermal energy (180 GJ) to kWh</p> $kW_{thermal} = 180 / 0.0036 = 50,000 \text{ kWh}$ $kWe = kW_{thermal} / COP = 50000 / 5 = 10000 \text{ kWh}$
2CEM009	1	15.1	<p>Answer = 1</p> <p>According to the table of conductance (C) and conductivity (K) given in the table:</p> <p>The k-value for 2-cm plywood is 0.115</p> $R_{plywood} = L / k = .02 \text{ m} / 0.115 = 0.174$ $R_{total} = R_{film-in} + R_{plywood} + R_{film-out} = 0.093 + 0.174 + 0.053 = 0.320 \text{ m}^2 \cdot ^\circ\text{C} / \text{W}$ $q = (A \cdot \Delta T) / R_{total} = (100 \cdot (16 - 0)) / 0.320 = 5000 \text{ W}$
2CEM010	2	10	<p>Answer = 2</p> $HDD = (18.3 ^\circ\text{C} - 10 ^\circ\text{C}) \times 3 \text{ days} = 24.9 ^\circ\text{C degree-days}$

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2CEM011	1	10	<p>Answer = 1</p> $Q = 1.4 \times 100 \times (3,000) \times (24) = 10.08 \text{ MWh/yr}$
2CEM012	1	8	<p>Answer = 1</p> <p>True.</p>
2CEM013	2	15.1	<p>Answer = 2</p> <p>Note that the performance of window films is measured by a shading coefficient (SC).</p> <p>- SC = 0, indicating that no heat passes; heat gain = 0.</p> <p>SC = 1, meaning it does nothing to stop heat; all heat radiation can pass through. Therefore, the fractional heat flow reduction due to the window film is given by (1 minus SC).</p> <p>Reduced heat gain = $0.4 \times 165,000 = 66,000 \text{ kJ/m}^2/\text{yr}$ Energy savings = $(66,000 \text{ kJ/m}^2/\text{year}) \times (1 \text{ kWh}/3600 \text{ kJ}) / (2.7) = 6.8 \text{ kWh/m}^2/\text{year}$</p> <p>Reduced Energy Cost = $6.8 \text{ kWh/m}^2/\text{year} \times \\$0.06/\text{kWh} = \\$0.41/\text{m}^2/\text{year}$ Cost/Savings = $(\\$2.00/\text{m}^2) / (\\$0.41/\text{m}^2/\text{year}) = 4.9 \text{ years}$</p>
2CEM014	4	10	<p>Answer = 4</p> $Q = U \times A \times DD/\text{yr} \times 24\text{h}/\text{day} \text{ Wh/yr}$ $Q = 1.6 \times 15 \times 3,500/\text{yr} \times 24\text{h}/\text{day} = 2,016 \text{ kWh/yr}$
2CEM015	1	10	<p>Answer = 1</p> $q = (5,000 \text{ LPS}) \times 1.2 \times (18 - 10) = 48 \text{ kW}$
2CEM016	1	8	<p>Answer = 1</p> <p>True</p>
2CEM017	1	10	<p>Answer = 1</p> $q = \text{LPS} \times 4.2 \times \Delta T \text{ kW}$ <p>$1 \text{ kW} = \text{LPS} \times 4.2 \times 6$</p> <p>$\text{LPS} = 1/(4.2 \times 6) = 0.04 \text{ Liters/second}$</p>
2CEM018	2	10	<p>Answer = 2</p> $q = (UA \times DD \times 24) = (3500 \times 1800 \times 24) / .8 = 189000 \text{ kWh/year}$ <p>$189000 \times .0036 = 680.4 \text{ GJ/year}$</p>

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2CEM019	1	15.1	<p>Answer = 1</p> <p>Conductance = conductivity k/thickness l (in meters).</p> <p>50 mm = 0.050 m</p> <p>$C = 0.029 / 0.050 = 0.58 \text{ W / m}^2\text{-}^\circ\text{C}$</p> <p>This means, for example, that a one-square-metre panel of 50-mm-thick Styrofoam SM will allow 0.58 watts of energy to pass through it under a one-degree Celsius temperature change.</p> <p>RS = resistance / conductance</p> <p>$R_s = 1 / 0.58 = 1.724 \text{ m}^2 (^\circ\text{C}) / \text{W}$</p>
2CEM020	1	10	<p>Answer = 1</p> <p>$= 50 + (150000 \times (0.09 + 0.025)) + 525 \times 8.5 =$</p> <p>$= \\$ 21,762.50 \times 1.08 \text{ (tax rate)} = \\$ 23,503.50$</p>
2CEM021	2	15.1	<p>Answer = 2</p> <p>The immediate cost on the month's electric bill has two components. Including sales taxes.</p> <p>Assume a demand rate of \$6.50/kW for the month plus 8% tax = \$7.02/kW and</p> <p>an energy rate of (\$0.09 + \$0.025)/kWh plus 8% tax = \$0.1242/kWh, then the immediate cost increase is:</p> <p>Demand cost increase = 400 kW x \$7.02/kW = \$2,808</p> <p>Energy cost increase = 400 kW x 0.5 hr x \$0.1242/kWh = \$24.84</p> <p>Total bill increase this month = \$2,808 + \$24.84 = \$2,832.84</p>

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2CEM022	1	15.1	<p>Answer = 1</p> <p>Power factor corrected demand = actual demand x (0.8/PF) = 250 kW x (0.8/0.75) = 266.7 kW</p> <p>Minimum demand charge (ratchet clause) = 500 kW x 0.65 = 325 kW</p> <p>The higher value is the final billed demand: (266.7 kW or 325 kW) = 325 kW</p> <p>- Keep in mind that if no power factor correction was applied, you would compare actual demand to the minimum demand charge as adjusted by the ratchet clause.</p> <p>Calculate the demand charge (peak season) as follows: 325 kW x \$ 13.27/kW = \$4,312.75</p> <p>Determine the energy charge: 54,000 kWh x \$0.05528/kWh = \$2,985.12</p> <p>Fuel adjustment is calculated as follows: 54,000 kWh x \$0.0115/kWh = \$621.00</p> <p>Total energy and fuel adjustment charges = \$ 2,985.12 + \$ 621.00 = \$ 3,606.12; customer charge = \$ 151.00.</p> <p>Before sales tax, the total charge is \$4,312.75 + \$3,606.12 + 151.00 = \$8,069.87. Sales tax = \$8,069.87 x 0.06 = \$484.19</p> <p>Total = \$8,069.87 + \$484.19 = \$8,554.06</p>
2CEM023	2	8	<p>Answer = 2</p> <p>True</p>
2CEM024	2	10	<p>Answer = 2</p> <p>Simple Payback (SPB) = First cost/ annual savings = \$10,000 / \$4,000 = 2.5 years This project will pay for itself within 2.5 years.</p>
2CEM025	2	10	<p>Answer = 2</p> <p>n = 10 years, A= \$ 4,000, i = 10%, P = ??</p> <p>From the tables, we choose the table with I = 10%, and pick the value of (P/A, I, n) for 10 years</p> <p>P = A (P/A, i, n) = \$4,000 x (4.1925) = \$ 16,770</p>
2CEM026	1	8	<p>Answer = 1</p> <p>True</p>
2CEM027	1	10	<p>Answer = 1</p> <p>NPV = A (P/A, I, n) - P = \$4,000 x (4.1925) - 10,000 = \$ 16,770 - \$ 10,000 = \$ 6,770 NPV > 0 , we should do this project.</p>

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2CEM028	1	15.1	<p>Answer = 1</p> <p>$n = 10$ years , $A = ??$, $i = 15\%$, $P = \\$ 3,000$</p> <p>Annual savings $A = P (A/P, I, n) = \\$ 3,000 \times (A/P, 15\%, 10)$</p> <p>Form the tables , we use the table with $I = 15\%$, and pick the value of $(A/P, I, n)$ for $n = 10$ years</p> <p>$A = \\$ 3,000 \times (A/P, 15\%, 10) = \\$ 3,000 \times (0.1993) = \\$ 597.9$</p>
2CEM029	1	10	<p>Answer = 1</p> <p>$n = 8$ years , $A = \\$ 4,200$, $i = 20\%$, $P = ???$</p> <p>$P = A (P/A, I, n) = \\$ 4,200 \times (P/A, 20\%, 8) = \\$ 4,200 \times (3.8372) = \\$ 16,116.24$</p>
2CEM030	1	15.1	<p>Answer = 1</p> <p>In order to determine this , we should find the (NPV) for the project</p> <p>Givens: $n = 15$ years , $A = \\$ 4,500$, $i = 15\%$, $P = \\$ 45,000$</p> <p>$NPV = A(P/A, 15\%, 15) - \text{Cost} = \\$ 4,500 (5.8474) - \\$ 45,000 = - \\$ 18,686$</p> <p>As the $NPV < 0$, this project is terrible and not recommended</p>
2CEM031	1	15.1	<p>Answer = 1</p> <p>The flue gas generated by burning the coal in the presence of air is:</p> <p>Flue gas quantity (per kg of coal): combustion air + quantity of fuel ash</p> <p>: $12 + 1 - 0.22$</p> <p>: 12.78 kg</p> <p>Quantity of flue gas produced by burning 5 kg of coal: $5 \times 12.78 = 63.9$ kg</p>
2CEM032	1	15.1	<p>Answer = 1</p> <p>In order to determine this, we should find the NPV for the project.</p> <p>Givens: $n = 15$ years, $A = \\$ 2,000$, $i = 10\%$, and $P = \\$ 15,000$</p> <p>$NPV = A(P/A, 10\%, 15) - \text{Cost} = \\$ 2,000 (7.6061) - \\$ 15,000 = \\$ 212.2$</p> <p>This is a marginal project because the NPV is greater than zero but very close to zero.</p>

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2CEM033	2	10	<p>Answer = 2</p> <p>$n = 6$, $A = 5,000$, $i = 15\%$, $P = ??$</p> <p>From the table it is a problem of find (P) given (A)</p> <p>Cost you can afford = $P = A (P/A, i, n) = 5,000 \times (3.784) = \\$18,920$</p> <p>This is the maximum the company's can pay for this project in order to achieve at least 15% return.</p>
2CEM034	1	15.1	<p>Answer = 1</p> <p>$P = \\$ 58,000$, $A = \\$ 15,000$, $i = 20\%$, $n = 10$ years, $NPV =$</p> <p>$NPV = A(P/A, 20\%, 10)$, Cost = \$15,000 (4.192), \$58,000 = \$4,880.</p> <p>This means the company would earn \$4,880.</p> <p>We would recommend this project because the net present value (NPV) is greater than zero.</p> <p>Please keep in mind that if the net present value (NPV) is less than zero, you should not proceed with this project because you will lose money.</p> <p>and in this case, the project will be indifferent economically.</p>
2CEM035	1	15.1	<p>Answer = 1</p> <p>P equals \$20,000, i equals 20%, n equals 5 years, and A equals?</p> <p>This issue can be found at (A) given (P).</p> <p>$A = P (A/P, i, n) = 20,000 (A/P, 12\%, 5) = 20,000 (0.2774) = \\$5,548$ per year</p> <p>So, the project must save at least this amount in order to achieve at least a 12% return.</p>

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2CEM036	2	15.1	<p>Answer = 2</p> <p>For this type of problem, to know which project to recommend, you have to find the NPV for each project separately and then choose the project with the higher NPV.</p> <p>The first project is</p> <p>$A = \\$33,000$, $P = \\$125,000$, $I = 12\%$, and $n = 8$ years.</p> <p>$A(P/A, 12\%, 8) - P = NPV1$.</p> <p>$NPV1 = \\$33,000 (4.9676) - \\$125,000 = \\$ 38,930.80$</p> <p>The second project:</p> <p>$A = \\$46,000$, $P = \\$153,000$, $I = 12\%$, and $n = 8$ years.</p> <p>$A(P/A, 12\%, 8) - P = NPV2$.</p> <p>$NPV2 = \\$46,000 (4.9676) - \\$153,000 = \\$ 75,509.60$</p> <p>From this solution, we found that the NPV was higher for the second project, so we would recommend it.</p>
2CEM037	1	8	<p>Answer = 1</p> <p>Adjust the baseline by performing a non-routine adjustment using the IPMVP tools.</p>
2CEM038	1	8	<p>Answer = 1</p> <p>Option A (spot measurement) is correct.</p>
2CEM039	2	8	<p>Answer = 2</p> <p>Continuous metering of the entire chiller (option B)</p>
2CEM040	4	8	<p>Answer =4</p> <p>All of the above</p>
2CEM041	4	8	<p>Answer = 4</p> <p>Increase the water pressure</p>
2CEM042	1	10	<p>Answer = 1</p> <p>$Q = M \cdot C_p \cdot \Delta T$ (C_p for water=4.2)</p> <p>$Q / (4.2 \cdot \Delta T) = M$</p> <p>$48000 / (4.2 \cdot (55 - 20)) = M$</p> <p>$M = 326.5 \text{ kg/hour} = 326.5 \text{ l/hour}$</p>
2CEM043	1	10	<p>Answer = 1</p> <p>$Q = M \cdot C_p \cdot \Delta T$ (C_p for water=4.2)</p> <p>$725 \cdot 4.2 \cdot (60^\circ\text{C} - 20^\circ\text{C}) \cdot 1 / 0.80 \cdot 1 \text{ GJ} / 1,000,000 \text{ kJ} \cdot \\$5 / \text{GJ} = Q$</p> <p>$Q = \\$0.76/\text{hour}$</p>
2CEM044	2	8	<p>Answer = 2</p> <p>Economizer and Interlock system</p>

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2CEM045	3	8	Answer = 3 "You cannot manage what you do not measure"
2CEM046	3	8	Answer = 3 Benchmarking process parameters will provide valuable indications of effectiveness of plant operation as well as energy use.
2CEM047	4	8	Answer = 4 All of the above
2CEM048	3	8	Answer = 3 Both
2CEM049	3	8	Answer = 3 Production Vs energy
2CEM050	1	10	Answer = 1 The required kVARs to bring the power factor back to unity is $kVAR = \sqrt{(kVA^2 - kW^2)} = \sqrt{(2500^2 - 2000^2)} = 1500 \text{ kVARs}$
2CEM051	4	8	Answer = 4 All of the above
2CEM052	1	15.1	Answer = 1 The flue gas generated by burning the coal in the presence of air is: Flue gas quantity (per kg of coal): combustion air + quantity of fuel ash : 12 + 1 - 0.22 : 12.78 kg Quantity of flue gas produced by burning 5 kg of coal: 5 x 12.78 = 63.9 kg
2CEM053	3	8	Answer = 3 Both
2CEM054	1	8	Answer = 1 kW/tonne of refrigeration
2CEM055	2	8	Answer = 2 Energy Performance
2CEM056	2	8	Answer = 2 Managerial and technical skills
2CEM057	4	8	Answer = 4 Future production projections
2CEM058	2	8	Answer = 2 Volume basis (dry)
2CEM059	4	8	Answer = 4 Benchmarking
2CEM060	4	8	Answer = 4 All of the above
2CEM061	1	8	Answer = 1 Provide variable speed with high efficiency

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2CEM062	4	8	Answer = 4 All of the above
2CEM063	4	8	Answer = 4 All of the above
2CEM064	3	8	Answer = 3 Both
2CEM065	4	8	Answer = 4 All of the above
2CEM066	4	8	Answer = 4 All of the above
2CEM067	4	8	Answer = 4 All of the above
2CEM068	3	8	Answer = 3 Both
2CEM069	3	8	Answer = 3 Both
2CEM070	4	8	Answer = 4 All of the above
2CEM071	3	8	Answer = 3 Corporate Management Services Department
2CEM072	2	8	Answer = 2 Accountability
2CEM073	2	8	Answer = 2 Greenhouse Gases
2CEM074	1	8	Answer = 1 CO ₂ , CH ₄
2CEM075	1	8	Answer = 1 UNFCCC
2CEM076	4	8	Answer = 4 All of the above
2CEM077	4	8	Answer = 4 All of the above
2CEM078	3	8	Answer = 3 Both
2CEM079	3	10	Answer = 3 Power consumption = (55 x 1000) = Power factor (Cos ϕ) = = $3 \times V \times I \times \text{Cos } \phi$ $3 \times 415 \times 80 \times \text{Cos } \phi$ (55 x 1000)/(3 x 415 x 80) 0.96
2CEM080	4	10	Answer = 4 Quantity of heat = m x Cp x ΔT = 25 x 0.25 x (75-25) = 312.5 kcal

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2CEM081	1	10	<p>Answer = 1</p> <p>Consumption of energy = $= 230 \times 2 \times 0.85 \times 12$</p> <p>$V \times I \times \cos \times \text{number of hours}$ $= 4692 \text{ Watt-hours or } 4.692 \text{ kWh}$</p>
2CEM082	2	8	<p>Answer = 2</p> <p>Cogeneration</p>
2CEM083	1	15.1	<p>Answer = 1</p> <p>This is different from the previous example as the two projects have different lifespans.</p> <p>To compare the two projects for two projects with different lifespans, we use the Annual Value (AV) as we cannot compare them using the (NPV)</p> <p>The first project:</p> <p>$A = \\$23,000, P = \\$85,000, I = 10\%, n = 12 \text{ years}$</p> <p>$AV1 = A - P(A/P, 10\%, 12)$</p> <p>$AV1 = \\$23,000 - \\$85,000 (0.1468) = \\$ 10,522.00$</p> <p>The second project:</p> <p>$A = \\$18,000, P = \\$75,000, I = 10\%, n = 9 \text{ years}$</p> <p>$AV2 = A - P(A/P, 10\%, 9)$</p> <p>$AV2 = \\$18,000 - \\$75,000 (0.1736) = \\$ 4,980.00$</p> <p>From this solution, we found that (AV) is higher for project#1 and so we would recommend doing the first project.</p>
2CEM084	1	15.1	<p>Answer = 1</p> <p>We can determine if this a good project by finding the (NPV)</p> <p>Givens: $A = (\\$ 2,300 - \\$700) = \\$1,600, P = \\$ 14,000, I = 15\%, n = 8 \text{ years}, NPV = ?$</p> <p>$NPV = A(P/A, 15\%, 8) - P = \\$1,600 (4.4873) - \\$14,000 = - \\$6,820.32$</p> <p>As the (NPV) is negative ($NPV < 0$), we would not recommend this project.</p>

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2CEM085	2	15.1	<p>Answer = 2</p> <p>We can determine if this is a good project by finding the NPV.</p> <p>Givens: $A = \\$4,000$, $P = \\$10,000$, $I = 20\%$, $n = 10$ years, $NPV = ?$</p> <p>$P = \\$4,000 (4.1925) - \\$10,000 = \\$6,770$ $NPV = A(P/A, 15\%, 8) - P = \\$4,000 (4.1925) - \\$10,000 = \\$6,770$</p> <p>As the NPV is positive ($NPV > 0$), we should do this project.</p>
2CEM086	1	10	<p>Answer = 1</p> <p>$(798.5 - 504.68) / 2201.5 = 13.3\%$</p>
2CEM087	2	8	<p>Answer = 2</p> <p>Water tube</p>
2CEM088	4	10	<p>Answer = 4</p> <p>the instrument read $= -0.85 * (1500 - 1480) + 1500 = 1517$</p>
2CEM089	2	8	<p>Answer = 2</p> <p>Controller</p>
2CEM090	2	10	<p>Answer = 2</p> <ul style="list-style-type: none"> $150000 / 10 = 15000$ $34000 - 15000 = 19000$ $0.34 * 19000 = 6460$ $34000 - 6460 = 27540$
2CEM091	1	10	<p>Answer = 1</p> <p>$123600 / 24 = 5150$,</p> <p>$24 - 8 = 16$ thus $123600 / 16 = 7725$</p>
2CEM092	1	10	<p>Answer = 1</p> <p>$4.2 * (13 - 3) * 1000 = 42000$</p> <p>$42000 / 3600 = 11.7 \text{ kWh/m}^3$</p>
2CEM093	3	8	<p>Answer = 3</p> <p>Renegotiate</p>
2CEM094	2	10	<p>Answer = 2</p> <p>$(50000 * (8 - 6)) / (30 * 1.01) = 3300$</p>
2CEM095	2	10	<p>Answer = 2</p> <p>$1500 - 1485 / (1500 - 1475) = 60\%$</p>
2CEM096	1	10	<p>Answer = 1</p> <p>$1 - 0.2 = 0.8$</p> <p>$75 * .8^3 = 38.4$. thus $75 - 38.4 = 36.6$</p>
2CEM097	1	10	<p>Answer = 1</p> <p>$250 / 4 = 62.5 \text{ kW}$</p>
2CEM098	1	10	<p>Answer = 1</p> <p>17°C wet bulb; 11.5°C dew point; 48 kJ/kg enthalpy</p>

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2CEM099	2	10	Answer = 2 $Q = LPS \times 1.2 \times \Delta h = 500 \times 1.2 \times (64 - 42) \times 3.6 = 47520$
2CEM100	3	10	Answer = 3 $00 / (4.2 \times 8) = 2.97$
2CEM101	4	8	Answer = 4 All of the above
2CEM102	1	8	Answer = 1 Owner
2CEM103	4	8	Answer = 4 Design Intent Document
2CEM104	2	8	Answer = 2 Document the error and inform the commissioning team.
2CEM105	1	8	Answer = 1 Owner's design intent, project specifications, industry guidelines, and approved submittals
2CEM106	1	8	Answer = 1 The plans and specifications
2CEM107	3	8	Answer = 3 Both
2CEM108	1	8	Answer = 1 During functional testing, as appropriate.
2CEM109	1	8	Answer = 1 Project Documents
2CEM110	1	8	Answer = 1 Data loggers
2CEM111	2	8	Answer = 2 Luminous flux incident on an object per unit area
2CEM112	3	8	Answer = 3 Installing separate lighting transformer and maintaining optimum voltage
2CEM113	4	8	Answer = 4 All of the above
2CEM114	3	8	Answer = 3 Both pressure and flow decreases
2CEM115	2	8	Answer = 2 around 85%
2CEM116	3	8	Answer = 3 Point of intersection of pump curve and system curve
2CEM117	1	8	Answer = 1 Lower start-up current
2CEM118	3	8	Answer = 3 Replacing the impeller with a smaller size impeller

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2CEM119	4	8	<p>Answer = 4</p> <p>All of the above</p>
2CEM120	1	15.1	<p>Answer = 1</p> <p>Design efficiency of pump</p> $\eta_P = \frac{Q(m^3/h) \times H(m) \times 9.81 \times W}{P \times 3600}$ <p>Q = 135m³/h; H=650m; P=315kW</p> <p>W = Specific weight of water at 105 °C = 0.95</p> <p>η_m = Motor efficiency 0.93</p> $\eta_P = \frac{135 \times 650 \times 9.81 \times 0.95}{315 \times 3600}$ <p>= 77.7%</p>