

QUESTIONNAIRE REPORT SHEET

iPQ4CEM.V1.1

iPQ.No	Correct Answer	Points	Explanation
4CEM001	2	10	Answer = 2 COP=18/3.6=5
4CEM002	2	10	Answer = 2 From the common material insulation table, $1/12.1 = 0.826$, thus plywood is 9.5 mm.
4CEM003	1	10	Answer = 1 $Q=1.16*500*1150*24=16008000\text{Wh/year}=16008\text{kWh/year}$
4CEM004	2	8	Answer = 2 Conduction, Convection, Radiation
4CEM005	1	8	Answer = 1 From air leak losses table $(21900/2) *4=43800 \text{ kWh}$
4CEM006	1	8	Answer = 1 True
4CEM007	2	8	Answer = 2 Refrigerant, Desiccant, Deliquescent
4CEM008	3	8	Answer = 3 Compressor optimization or optimum sequencing
4CEM009	4	8	Answer = 4 Moisture, latent, dry bulb, sensible, moisture
4CEM010	1	10	Answer = 1 $24000/ (4.2(54-18))=158.7 \text{ liters/h}$
4CEM011	4	8	Answer = 4 All of the above
4CEM012	1	8	Answer = 1 True
4CEM013	3	8	Answer = 3 30 % of World reserve
4CEM014	2	8	Answer = 2 Energy intensity
4CEM015	1	8	Answer = 1 Carbon Monoxide
4CEM016	2	8	Answer = 2 False
4CEM017	4	8	Answer = 4 All of the above
4CEM018	4	8	Answer = 4 All of the above

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4CEM019	2	8	Answer = 2 Capital costs
4CEM020	3	8	Answer = 3 Both
4CEM021	1	8	Answer = 1 $DD = (27.8 - 18.3) \times 30 = 285$
4CEM022	1	10	Answer = 1 $P = 5000 \times (5.421) = \27105
4CEM023	2	10	Answer = 2 False
4CEM024	2	10	Answer = 2 The first project: $NPV = 7500 \times 5.724 + 9500 = \52430 The second project: $NPV = 4700 \times 5.724 + 15000 = \41902.8 (lowest)
4CEM025	2	10	Answer = 2 $NPV = -2.7 \times 106 + 300000 \times 4.87 - 28000 \times 4.87 = \-1375360 negative NPV will result in a net loss
4CEM026	1	8	Answer = 1 True
4CEM027	1	10	Answer = 1 $189000 = 48115 \times IRR$ thus $IRR = 189000 / 48115 = 3.928$ Then from the table (compound interest factor) 25%
4CEM028	2	10	Answer = 2 The first project: $AV1 = 36000 - 135000 \times 0.2591 = \1021.5 The second project: $AV2 = 46000 - 148000 \times .2529 = \8570.8 this is more than the first project.
4CEM029	1	17.83	Answer = 1 $1.4M / 10 = 140000$ $235000 - 140000 = 95000$ $95000 \times 0.34 = 32300$ $235000 - 32300 = \$202700$

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4CEM030	1	10	<p>Answer = 1</p> <p>According to the power factor table</p> <p>$kVAR = 700 * 0.344 = 240.8$ (Approximately)</p>
4CEM031	1	8	<p>Answer = 1</p> <p>IEEE 519</p>
4CEM032	2	8	<p>Answer = 2</p> <p>Increasing the excess air flow rate</p>
4CEM033	3	8	<p>Answer = 3</p> <p>Ceramic coatings in furnace chamber promote rapid and efficient transfer of heat, uniform heating and extended life of refractories. The emissivity of ceramic coated refractories increases with increase in temperature. Energy savings to an order of 8 to 10% can be achieved for high temperature applications.</p>
4CEM034	4	8	<p>Answer = 4</p> <p>All of the above</p>
4CEM035	3	8	<p>Answer = 3</p> <p>The optimization of combustion air is the most attractive and economical measure for energy conservation. The impact of this measure is higher when the temperature of furnace is high.</p>
4CEM036	1	8	<p>Answer = 1</p> <p>100%</p>
4CEM037	1	10	<p>Answer = 1</p> <p>$kW_{input} = (110 * 0.85) / 0.935 = 100kW$</p>
4CEM038	1	10	<p>Answer = 1</p> <p>$S = 100 / .9 = 111kVA$</p>
4CEM039	4	8	<p>Answer = 4</p> <p>All of the above</p>
4CEM040	1	10	<p>Answer = 1</p> <p>$Lux = (20 * 2 * 3000 * 0.65 * 0.7) / (12 * 10) = 455$</p>
4CEM041	1	10	<p>Answer = 1</p> <p>The first system is $(500 * 200 * 3500 * .1) / 1000 = \\35000.</p> <p>The second system is $(500 * 120 * 2000 * .1) / 1000 = \\$12,000$.</p> <p>The savings = $35000 - 12000 = \\$23000$</p>
4CEM042	4	8	<p>Answer = 4</p> <p>All of the above</p>
4CEM043	3	8	<p>Answer = 3</p> <p>Both</p>
4CEM044	4	10	<p>Answer = 4</p> <p>6000k</p>

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4CEM045	2	8	Answer = 2 Continuous or real-time commissioning
4CEM046	3	8	Answer = 3 At the start of the new building project,
4CEM047	3	8	Answer = 3 Environmental regulations, productivity, and quality improvement
4CEM048	1	10	Answer = 1 $4.2\text{kJ} \times 10 = 42\text{kJ}$
4CEM049	3	8	Answer = 3 Type II and Type III
4CEM050	3	8	Answer = 3 Both
4CEM051	2	8	Answer = 2 Facility load factor
4CEM052	1	8	Answer = 1 High pressure steam with super heat
4CEM053	2	8	Answer = 2 Thermostatic trap
4CEM054	4	8	Answer = 4 Combustion/flue gas analyzers, thermometers
4CEM055	4	8	Answer = 4 A purchasing contract that automatically renews itself unless either contract party notifies the other of the intent to renegotiate
4CEM056	2	10	Answer = 2 19,500 GJ
4CEM057	1	10	Answer = 1 Electricity cost = $(10/0.8) \times 0.97 \times 0.0036 = \$0.04365/\text{kWh}$
4CEM058	1	17.83	Answer = 1 Gas = $9/0.82 = \$10.98/\text{GJ}$ Electric = $0.1/0.0036/0.97 = \$28.64$ Propane = $1.5/0.0457/0.78 = 42.08$
4CEM059	1	17.83	Answer = 1 $\text{EUI} = (17500000 + (12000000 \times 3.6))/25000 = 2428\text{MJ}/\text{m}^2\text{-yr}$
4CEM060	1	17.83	Answer = 1 $\text{ECI} = ((17500 \times 10) + (12000000 \times 0.115))/25000 = \$62.2/\text{m}^2\text{-yr}$
4CEM061	2	8	Answer = 2 Fuel, operation, and maintenance

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4CEM062	3	8	Answer = 3 Ammeter CT is correctly oriented; Ammeter CT is on the proper electrical phase.
4CEM063	1	8	Answer = 1 kW/kVA
4CEM064	1	10	Answer = 1 Actual kWh/(peak kW*time) = load factor. Average demand=Actual/time Average demand = 422 * 0.73 = 308.06 kW
4CEM065	1	10	Answer = 1 940*0.75=705kW 705-650=55kW
4CEM066	1	10	Answer = 1 Thermal environmental conditions for human occupancy
4CEM067	1	10	Answer = 1 \$0.10/kWh *(kWh/3600 kJ) *(1/0.90) *(0.80) *(1,000000 kJ/ GJ) = \$24.69/GJ
4CEM068	1	10	Answer = 1 $A = P (A/P I, n) = (\$10,000) * (4.4873) = \$44,873$
4CEM069	3	8	Answer = 3 Voltmeter
4CEM070	1	10	Answer = 1 Capacitor = (1000 kW) * (PF table value) = (1000 kW) * (0.536 kVAR/kW) = 536 kVAR
4CEM071	1	10	Answer = 1 Capacitor = (315 kW) * (0.75)]105.8 kVAR *(PF table value) = [251.33 kW]*(0.421)
4CEM072	4	8	Answer = 4 All of the above
4CEM073	1	17.83	Answer = 1 (37 kW) - (5.5 kW) = Demand Save*(1/0.90) = 35 kW Saved Energy = [(37 kW) - (5.5 kW)]*(1/0.90) *(8760 hrs.) = 306,600 kWh/yr. Savings = [(35 kW) * (\$10.00 / kW-month) *(12 months/year)]+ [(306,600 kWh per year * \$0.10/kWh)]= \$34,860 / yr.
4CEM074	1	10	Answer = 1 (LPS)(1.2)(T) in Watts = Loss in Watts [short method] Loss = (5000 LPS)(1.2)(5°C)/1000 = 30 kW

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4CEM075	2	17.83	<p>Answer = 2</p> <p>Energy = (mass flow rate) (h)</p> <p>According to the Psychrometric Chart:</p> <p>Enthalpy (20 °Cdb, 50% RH) h1 = 39 kJ/kg</p> <p>Enthalpy (31 °Cdb, same absolute moisture) h2 = 50 kJ/kg</p> <p>(5000 liters/second) (kg/0.84 m3) (m3/1000 liters)](50–39 kJ/kg)</p> <p>(kWh/3600 kJ)(3600 sec/h) = 65 kW</p> <p>Energy = 5000 litres/s * 1.2 * (50-39) = 66 kW approximately (short method)</p>
4CEM076	2	17.83	<p>Answer = 2</p> <p>$q = UA\Delta T$; $UA = 7 \text{ kWt/}^\circ\text{C}$</p> <p>Heat energy = (UA) (HDD) (24 h/d)</p> <p>$(UA)(HDD)(24 \text{ h/d})(1/\text{eff}) = \text{fuel energy}$</p> <p>$(7 \text{ kWt/}^\circ\text{C}) * (1,950^\circ\text{C-day/year}) * (24 \text{ h/day}) * (1/0.80) * (3600 \text{ kJ/kWh}) * (1,000,000 \text{ kJ/GJ})$</p> <p>Fuel = 1,474 GJ per year.</p>
4CEM077	1	17.83	<p>Answer = 1</p> <p>Cost = $[(1/R)(\text{Area})](HDD)(24 \text{ h/d})(1/\text{eff})(\text{fuel unit cost})$</p> <p>Cost/Area = $(1/0.5 \text{ m}^2\text{-}^\circ\text{C/W})(2700^\circ\text{C-day/yr})(24 \text{ h/day})(1/0.80)$</p> <p>$(\\$10.00 / \text{GJ})(3.6 \text{ J/W-h}) (1 \text{ GJ}/1,000,000 \text{ kJ}) = \\$5.832 / \text{m}^2\text{-yr}$</p>
4CEM078	3	8	<p>Answer = 3</p> <p>Both</p>
4CEM079	1	8	<p>Answer = 1</p> <p>It captures the latent heat from the water condensing in the exhaust gas and delivers this heat to the boiler.</p>
4CEM080	4	8	<p>Answer = 4</p> <p>Recover condensate in an insulated system at or near boiler pressure</p>
4CEM081	4	8	<p>Answer = 4</p> <p>All of the above</p>
4CEM082	2	10	<p>Answer = 2</p> <p>$\% = (\text{RAT} - \text{MAT})/(\text{RAT} - \text{OAT})$</p> <p>$= (22 - 18.3)/(22 - 5) = 21.8\%$</p>
4CEM083	3	10	<p>Answer = 3</p> <p>\$1620.00</p>
4CEM084	3	8	<p>Answer = 3</p> <p>Differential</p>
4CEM085	1	10	<p>Answer = 1</p> <p>$L/s = C_v \sqrt{PD} = 0.01 \sqrt{100} = 0.1 \text{ L/s}$</p>

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4CEM086	2	8	Answer = 2 Essentially base load the chiller (i.e., operate at a high load most of the time).
4CEM087	3	17.83	Answer = 3 From combustion chart $\text{Eff}_{\text{OLD}} = 80.5\%$ $\text{Eff}_{\text{NEW}} = 82.7\%$ $\% \text{ savings} = (\text{Eff}_{\text{NEW}} - \text{Eff}_{\text{OLD}})/\text{Eff}_{\text{NEW}}$ $= (82.7 - 80.5)/82.7 = 2.65\%$
4CEM088	4	8	Answer = 4 All of the above
4CEM089	4	8	Answer = 4 Coal
4CEM090	2	10	Answer = 2 Input = 300 kW x (1/0.8) = 375 kW = 375,000 J/s
4CEM091	4	8	Answer = 4 Axial compressor
4CEM092	3	8	Answer = 3 Heat wheel
4CEM093	3	8	Answer = 3 Both
4CEM094	1	10	Answer = 1 The technique used to evaluate the financial viability of projects is the profitability index. THIS IS GIVEN BY RATIO of Sum of discounted net savings and Capital costs $= 1.2 / 1.0 * 100 = 120\%$
4CEM095	4	8	Answer =4 All of the above
4CEM096	2	10	Answer = 2 Excess air supplied = $7900 \times (20.67 - 14) / 14 \times (100 - 20.67) = 47.44\%$
4CEM097	1	17.83	Answer = 1 Evaporator temperature (T ₁) = -15 °C Condenser temperature (T ₂) = 30 °C CoP of ideal cycle = $T_1/(T_2-T_1)$ $= \frac{(-15 + 273)}{(30 + 273) - (-15 + 273)} = 5.7$
4CEM098	3	8	Answer = 3 Scroll
4CEM099	1	10	Answer = 1 0.65–0.8kW/TR
4CEM100	2	10	Answer = 2 3%

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4CEM101	3	8	<p>Answer = 3</p> <p>Point of intersection of the pump curve and the system curve</p>
4CEM102	1	17.83	<p>Answer = 1</p> <p>Design efficiency of pump</p> $\eta_P = \frac{Q(m^3/h) \times H(m) \times 9.81 \times W}{\eta \times 3600}$ <p>Q = 135 m³/h; H = 650 m; P = 315 kW</p> <p>W = Specific weight of water at 105 °C = 0.95</p> <p>η_m = Motor efficiency 0.93</p> $\eta_P = \frac{135 \times 650 \times 9.81 \times 0.95}{0.93 \times 3600 \times 314}$ <p>= 77.7%</p>
4CEM103	2	8	<p>Answer = 2</p> <p>Intelligent power factor controller</p>
4CEM104	3	8	<p>Answer = 3</p> <p>Variable speed system requirement</p>
4CEM105	4	8	<p>Answer = 4</p> <p>Movement or noise detector in room space</p>
4CEM106	1	10	<p>Answer = 1</p> <p>Load factor is a ratio of the average demand (kVA or kW) to the peak demand for a power system.</p> <p>Average yearly consumption = 150.0 lakh kWh</p> <p>Load Factor = 150,00,000 / (8760 hr x 2421 x 0.95)</p> <p>LF = 74.45%</p>
4CEM107	3	8	<p>Answer = 3</p> <p>Both</p>
4CEM108	1	10	<p>Answer = 1</p> <p>Transformer losses = No load losses + (% loading)² x Full load losses</p> <p>= 2 + (0.6)² x 25</p> <p>= 11 kW</p>
4CEM109	4	8	<p>Answer = 4</p> <p>All of the above</p>
4CEM110	4	8	<p>Answer = 4</p> <p>All of the above</p>
4CEM111	3	8	<p>Answer = 3</p> <p>Both</p>

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4CEM112	3	8	Answer = 3 Luminous flux incident on an object per unit area
4CEM113	3	8	Answer = 3 Installing separate lighting transformer and maintaining optimum voltage
4CEM114	4	8	Answer = 4 To remove any remaining moisture after the after-cooler
4CEM115	4	8	Answer = 4 The compressor should not be operated close to the surge point.
4CEM116	3	8	Answer = 3 Energy consumption increases by 1% for every 4 oC increase in inter-air temperature.
4CEM117	1	8	Answer = 1 Two stage reciprocating compressors
4CEM118	2	8	Answer = 2 Centrifugal compressors
4CEM119	1	17.83	Answer = 1 The system leakage is calculated by: System leakage in 'm ³ /min' = $\frac{Q \times T}{(T + t)}$ Where Q = Actual free air being supplied during trial in m ³ /min T = Load time in minutes t = Unload time in minutes = 200 x 10 / (10 + 20) = 67 m ³ /min
4CEM120	3	8	Answer = 3 Security of plant