| Tanta University | | Mechanical Power Engineering Department<br>Course Title: Refrigeration and air conditioning (B), MEP3107 | | Faculty Of Engineering |
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| Dept | Mechanical Power Engineering | Date | May 18th 2015 |
| Year | 3rd, (new curriculum) 2005 | Allowed time | 3 hrs |
| Reset exam | June (second term) | Total Marks | 125 Marks |
| | | Academic Number | 2014/2015 |

Close book exam. Answer all questions. Draw schematic whenever applicable, and clearly state your assumptions. Air conditioning tables and chart are permitted

يسمح للطالب باستخدام خرائط وجداول تكييف الهواء.

Question (1) (20 marks)

A)- After a long walk in the 8°C outdoors, a person wearing glasses enters a room at 25°C and 40% relative humidity. Determine whether the glasses will become fogged?

B)- Air at 1 atm, 15°C, and 60% relative humidity is first heated to 30°C in a heating section and then is passed through an evapotative cooler where its temperature drops to 25°C. Determine:

(a)- The exit relative humidity, and

(b)- The amount of water added to the air in kg water/kg dry air

Question (2) (26 marks)

(a)- Define the following: humidity ratio, relative humidity, and dew point?

(b)- A summer air conditioning apparatus is used for cooling and dehumidification to maintain 21°C d.b.t and 70% RH in a print shop which has an estimated sensible heat gain of 58.15 kW and latent heat gain of 17.445 kW under design condition. Assuming that all the air is re-circulated, find:

a) Sensible heat factor.
b) The apparatus dew point temperature.
c) The rate of circulated air per second.
d) The tons of refrigeration of the refrigerating machine.
e) Compute the refrigeration capacity in case of using 50% of fresh air at 39°C d.b.t and 27°C w.b.t and 50% of returned air from the shop

Sketch the thermodynamic processes for both cases (100% , 50% and 25% returned air) on the psychrometric chart

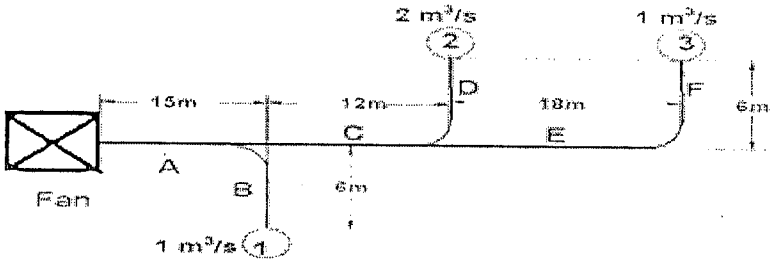
Question (3) (33 marks)

A 40*30 m gym hall (in a middle floor building) is to be conditioned. Space height is 6m. The hall has 2.0$m^2$ south windows that has no external shading. The windows are double-glazing with a 6.4 mm air space and with regular plate glass inside and out (U=3.94 W/$m^2$. °C). Draperies with shading coefficient of 0.7 are fully closed. All walls are internal walls except south wall. 24m side wall facing north has the entrance door of the hall. All walls are constructed of 200mm concrete block. Ceiling has mass inside insulation with suspended ceiling and R-value = 2.5 $m^2$k/W. The hall could be occupied by 400 persons. Lighting is 25 W/$m^2$ and no equipment. Indoor air is at 24°C and 50% R.H and outdoor air is assumed to be 38°C and 45% R.H. Calculate the space total cooling load. Assume ventilation rate of 2.5 L/s per person and base your calculations on 21 August, 16:00 O'clock and 32° north latitude. Also, assume that all neighbours spaces through walls and ceiling are not conditioned space.

Question (4) (24 marks)

(a) List the main advantages of using waste energy recovery in air conditioning systems?, Sketch three types of heat recovery air conditioning systems?

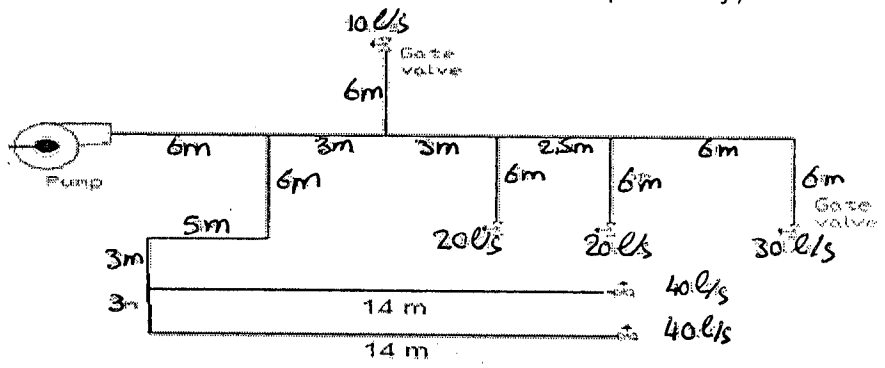
(b) The following figure shows a typical duct layout. Design the duct system. Take the velocity of air in the main duct as 8 m/s. Compute also, the total pressure loss.




Question (5) (22 marks)

(a) Sketch direct return and reverse return piping arrangements for units piped vertically? Explain the major difference between the two arrangements?

(b) In the piping system shown schematically, size the pipes and calculate the total pressure loss (assume that, the equivalent length for each fitting losses, gate valve and check valve are is 0.8 m, 0.4 m and 6 m respectively)




All the best

Dr. Y. EL-Samadony

Tanta University

Department: Electrical Power and Machines Engineering
Total Marks: 125 Marks

Faculty of Engineering

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|---|---|---|
| Course Title: Electric Power | Course Code: EPM3248 | Year: 3rd |
| Date: 18 May 2015 | Allowed time: 3 hrs | No. of pages: (2) |

## Answer all the following questions:

### Question (1) (30 Marks)

a) Reorder the following power plants from the lower capital cost to the higher capital cost and from the base load to the peak load:
- Steam power plant
- Diesel power plant
- Gas power plant
- Hydroelectric power plant.

(15 Marks)

b) Maximum demand of a generating station is 100 MW with a load factor is 65%. The plant capacity factor and plant use factor are 50% and 80%, respectively. Determine:
1. Utilization factor.
2. Plant operation time in hours if plant is running at full load as per operating schedule.
3. Reserve capacity.

(15 Marks)

### Question (2) (30 Marks)

a) Explain Ferranti effect in transmission lines. (10 Marks)

b) A 3-phase 50 Hz transmission line 400 km long delivers 125 MW at 0.8 p.f. lagging and at 400 kV. The resistance and reactance of the line per phase per km are 0.15 ohm and 0.78 ohm respectively while admittance is $5\times10^{-6}$ mho/km/phase. Assuming that the total capacitance of the line is localized at the receiving end alone. Derive the ABCD constants of T.L. Then, calculate the efficiency of the line. (20 Marks)

### Question (3) (35 Marks)

a) Derive an expression for the sag in transmission lines between supports at the same level. (5 Marks)

b) A string of 4 insulator units has mutual capacitance equal to 9 times the pin-to-earth capacitance (C). Find:
1. Voltage distribution across various units as percent of total voltage across string.
2. String efficiency.
3. Find the capacitance of the guard ring needed to make the efficiency 100%.

(15 Marks)

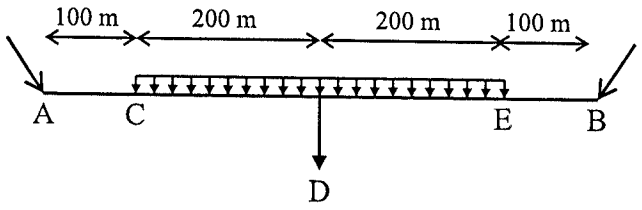
c) An overhead line is supported on two poles 200 m apart having a difference in level of 10 m. The conductor diameter is 2 cm and weighs 2.3 kg/m. Calculate the sag at the lower support if wind provides a pressure of 57.5 kg/m$^2$ acting on the projected area and the factor of safety is 4. The maximum tensile strength is 8000 kg.

(15 Marks)

**Question (4)** **(30 Marks)**

a) Derive an expression for the insulation resistance and capacitance of a single core cable. (10 Marks)

b) A 2-wire DC distributor AB of 600 m long is fed from both ends and is loaded with a load of 100 A at the middle point D in addition to a distributed load of 1.0 A/m extending from point C to point E as shown in the figure. Calculate the voltages at the feeding points A and B if the minimum voltage was 218.5 V at a distance of 200 m from the end A. Resistance of the distributer (go and return) is 0.1 Ω/km. (20 Marks)




**Best wishes:**

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**Dr. Diaa-Eldin Mansour and Examination Committee**