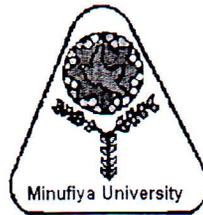


Minoufiya University
Faculty of Engineering
Mechanical Power Eng. Dept
Academic Year: 2016-2017
Date:14-1-2017



Subject: Industrial
Code: MPE 502
Academic level: Diploma.
Time allowed: 3 hours
Total degree: 100 marks

Answer all the following questions:

Question-1

[25 marks]

- a- Mention the different sources of air pollution inside closed spaces, and discuss types of contaminants.
- b- Explain with details the meaning of IAQ.
- c- Explain the methods which are used to control and treat the indoor air pollutants.
- d- Describe using diagrammatic sketch the operation of natural ventilation system and report its advantages and disadvantages.

Question-2

[25 marks]

- a- Show the difference between the two methods of industrial ventilation system (i.e. dilution and local exhaust), and mention only the disadvantages of each method.
- d- What are the general rules for duct design to obtain the optimum performance?
- c- Discuss the difference between fans, blowers and compressors.
- d- Explain with the aid of a diagram the performance curve of a fan under specific conditions of fan volume and system static pressure.

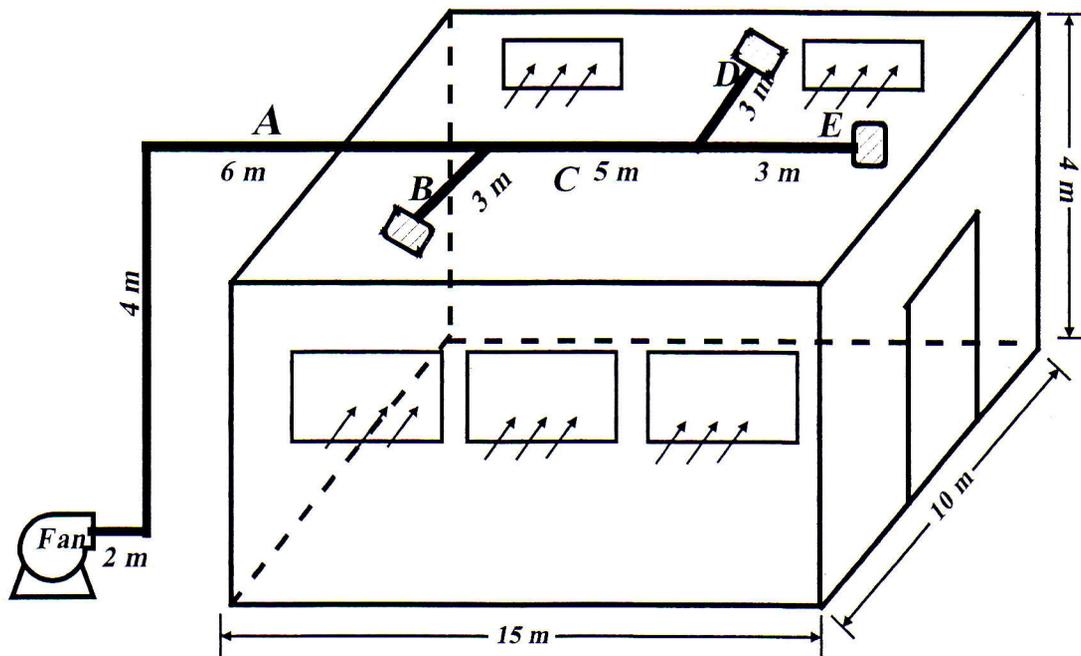
Question-3

[50 marks]

- A restaurant has the dimensions as shown in the next figure. The inlet openings have dimensions (60 cm×125 cm). The exit ventilation openings have dimensions (25 cm×120 cm). The difference between the levels of inlet and exit opening (i.e. ΔH) is 1.0 m and the discharge coefficient C_D is 0.63 for all the openings. The dynamic pressure head at the inlet opening is neglected. The average temperature inside the garage is 38 °C while the outside temperature is 24 °C. The air flow rate from duct openings are $Q_B = 30\%$ of the fan flow rate and $Q_D = 45\%$ of

the fan flow rate. Take the pressure loss coefficients at bend is 0.85 and the exit is 1.0 along the duct. Also, take the velocity for the main duct is 8 m/s and the fan efficiency is 85%. Assume any required data and calculate the following:

- i- The required air flow rate if the air change rate (ACR) equals 10.
- ii- The natural flow rate based on the buoyancy effect only.
- iii- Design the ventilation duct using the equal friction coefficient method.
- iv- The pressure losses at the exit damper.
- v- The fan horse Power (HP).



Use the following relations if you need:

$$\frac{\Delta P_f}{L} = \frac{0.022243 \dot{Q}_{air}^{1.85}}{D^{4.973}} \quad , \quad D_{eq,B} = D_{eq,A} \left(\frac{Q_B}{Q_A} \right)^{\left(\frac{1.85}{4.973} \right)} \quad , \quad D_{eq} = 1.3 \frac{(ab)^{0.625}}{(a+b)^{0.25}}$$

$$\dot{V} = A_e C_e \sqrt{\frac{2g\Delta H\Delta T}{\bar{T}}} \quad , \quad \frac{1}{(A_e C_e)^2} = \frac{1}{(\sum A_i C_i)^2} + \frac{1}{(\sum A_o C_o)^2}$$

With best wishes

Dr. Ashraf Amin