Minoufia University Faculty of Engineering Mechanical Power Eng. Dept Academic Year: 2017-2018 Date: 30-12-2017	Minufiya University	Subject: Industrial Ventilation Code: MPE 502 Academic level: Diploma. Time allowed: 3 hours Total degree: 100 marks

Answer all the following questions:

Question-1 ***[25marks]***

a- Particulate matter one of the main sources of the indoor air pollution, classify solid particles contaminants and mentions its hazards on the human health.

b- Explain with sketch the different Methods to control contaminants of air inside closed spaces.

c- Describe using diagrammatic sketch the natural ventilation system and report its advantages and disadvantages.

d- Show the difference between the three methods of industrial ventilation system (i.e. dilution and local exhaust), and mention only the disadvantages of each method.

Question-2 ***[25 marks]***

a- What are the chief requirements of an air ventilation duct systems?

b- Discuss the difference between the fans, blower and the compressor.

c- Explain with sketch the difference type of an axial fans and mention advantages and disadvantage of each type.

d- Explain with the aid of a diagram the performance curve of a fan under specific conditions of fan (volume flow rate, system static pressure and efficiency).

e- Discus the purposes of hood ventilation and the meaning of capture velocity. Also, explain with sketch the different types of Ventilation hoods.

Question-3 ***[50 marks]***

- A garage has the dimensions as shown in the next figure. The inlet and exit openings have the same shape and the same dimensions (40 cm×125 cm). The difference height between inlet and exit opening (i.e. H) is 1.2 m and the discharge coefficient C_D is 0.61 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 27°C. The air flow rate from duct openings are Q_B=30% of the fan flow rate and Q_D=Q_E=35% of the fan flow rate. Take the pressure loss coefficients at bend is 0.8 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 0.82. ***Assume any required data and calculate the following:***

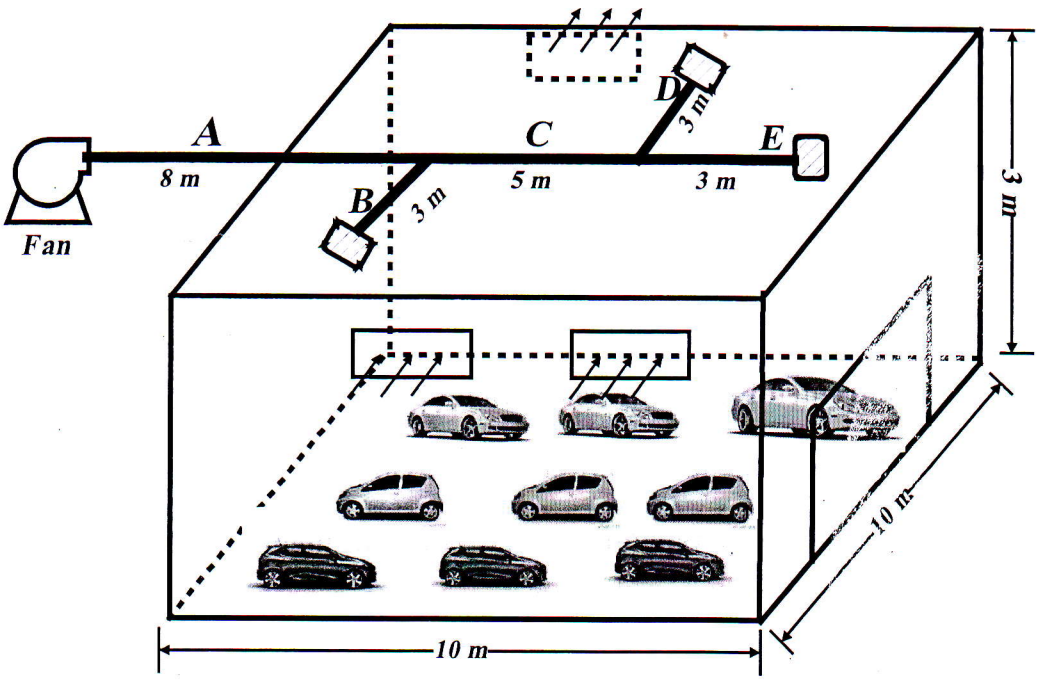
i- The required air flow rate if ACR=6.

ii- The natural flow rate based on the buoyancy effect only.

iii- Design the ventilation duct by 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:

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

$$\dot{V} = A_e\,C_e\sqrt{\frac{2\,g\,\Delta H\,\Delta T}{\overline{T}}} \quad , \quad \frac{1}{(A_eC_e)^2} = \frac{1}{(\sum A_iC_i)^2} + \frac{1}{(\sum A_oC_o)^2}$$

With best wishes

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