Mine 402 Final Examination

Duration 2.5 hours

December 6, 2011

Exam is closed book. You are allowed one 8.5x11 formula sheet (both sides) . Answer 5 of the 6 questions All questions are of equal value. If you do more than 5 I will only mark the first 5.

Note if you are running out of time indicate how you would solve the problem and what equations you would use

One (25)

A dipping airway drops through a vertical distance of 300 m between stations 1 and two. The following observations were made

	Velocity m/s	Pressure kPa	Temperate C	Airflow Q $m^{3/s}$
Station 1	2.5	94	27	50
Station 2	3.5	97	31	

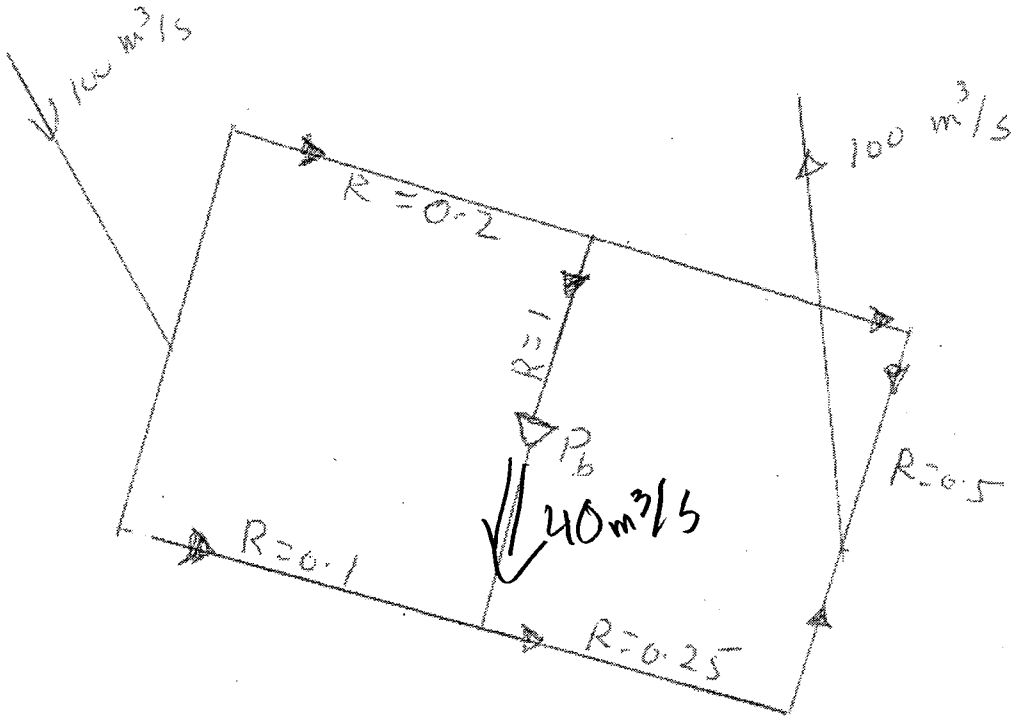
Calculate

a) The rate and direction of heat transfer, assuming no other sources of heat. Express the heat transfer in kW assuming standard air density.

Two(25)

The Figure below shows a ventilation network. The booster fan is to provide 40 cubic meters of air per second. Solve for the airflows and the total booster fan pressure.

Robert Hall
Room 511 Forward Building
Phone: 822-0066



Robert Hall
Room 511 Forward Building
Phone: 822-0066

Three (25)

a) Describe the methods for doing a ventilation survey and discuss their strengths and weakness
b) Briefly discuss what the main theme of the presentation from Teck on Health and Safety
c) Where does guest speaker Charles Kocsis work? He discussed a new approach to ventilation design. Can you summarize it in a few words?
d) Summarize what you learned about noise from Dr. Hodgson.
e) Now that you have done a preliminary ventilation design for Avalon Metals discuss what you have learned that you feel would benefit other starting a similar design for the first time.

SUDBURY – VENT ON DEMAND

Four (25)

300,000 tons of rock are broken per 30 day month in a mine at a depth where the average virgin rock temperature is 40 degrees C. By the time this rock reaches the surface in a skip it has been cooled to 20 degrees C. Note that the rocks thermal capacity (C_p) is 0.837kJ/kg K and Cp of air is 1005 J/Kg K

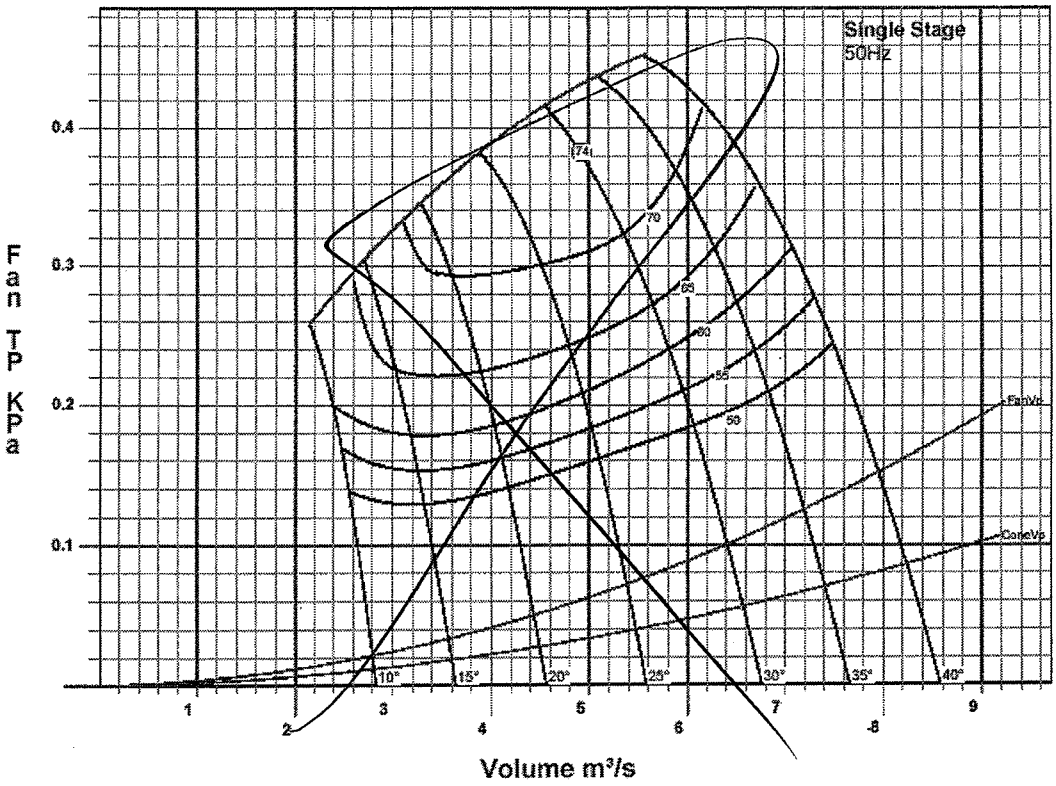
a. What is the rate at which heat is released by the broken rock?
b. If the mine is ventilated using 700 m^3/s of air at a density of 1.2 kg/m^3 how much will the temperatureof the air increase
c. If you didn't know the virgin rock temperature what process would you use to measure it?

Five (25)

You are working at a mine and have been asked to select a fan from three fan curves supplied by Alphair. The estimated flow requirements over the life of the mine range from 5 to 6 m^3/s.

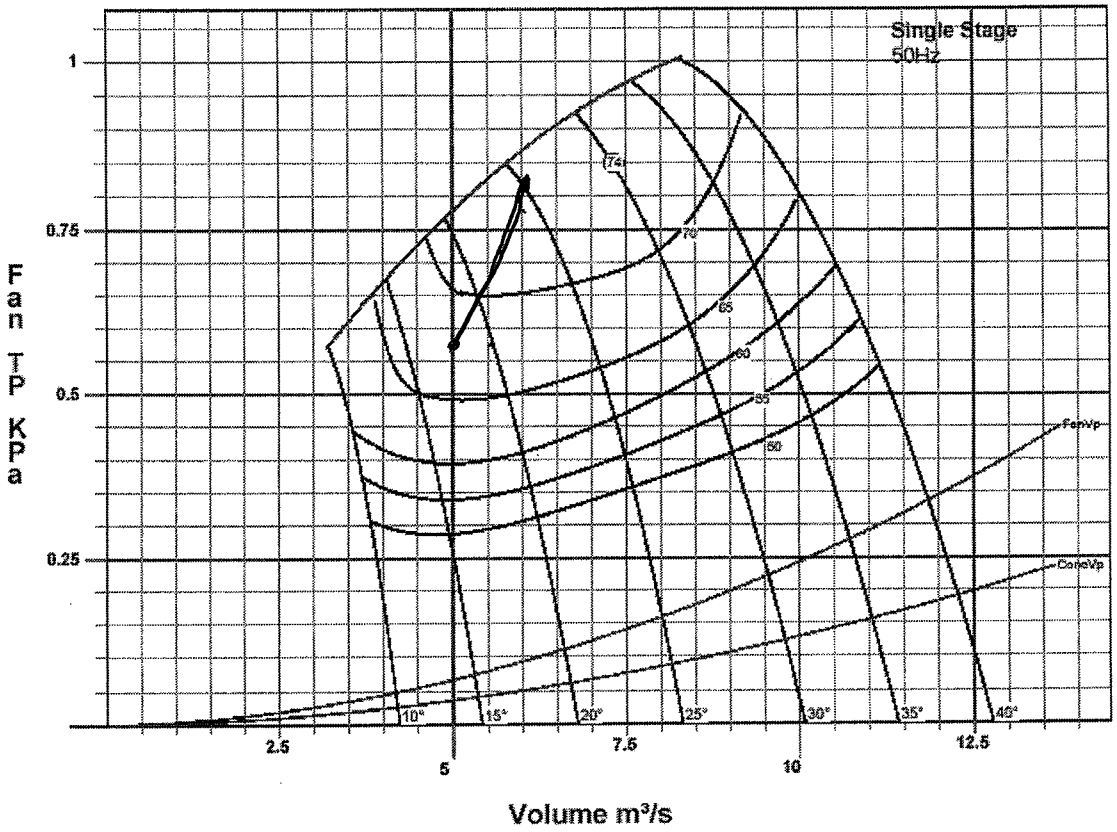
a) If the mine has a total resistance of 23.0 N s^2/m^8 which fan would you choose? Explain
b) What size motor would you recommend for the fan you chose?
c) Assume that it was decided to put two of the fans you selected in (a) in parallel **discuss** how you would determine the new operating point for the two fans in parallel.
d) For the installation in (b) point out any thing that needs to be included in the design and installation.

Robert Hall
Room 511 Forward Building
Phone: 822-0066



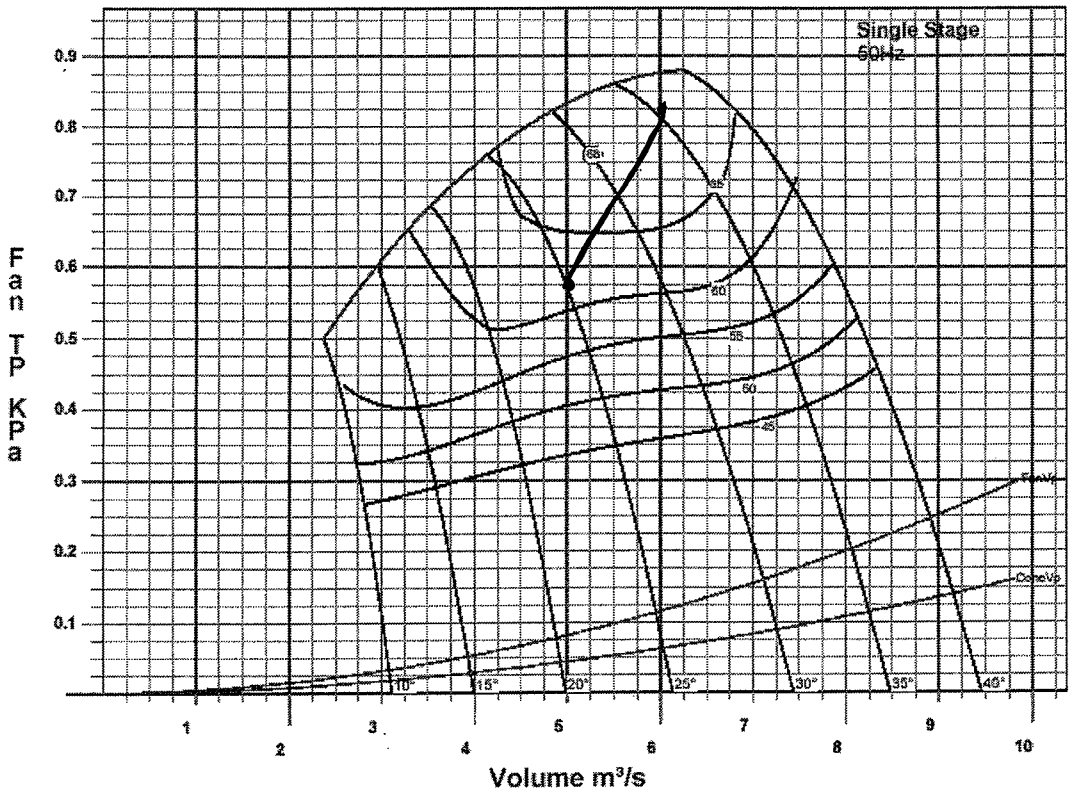
Fan Performance Curve	3200-VAX-2100 Full Balde	ReV. 000607-01
Diameter: 0.8128 m Altitude: 0 m Asl Density: 1.201 Kg/m³	Speed: 980 Rpm Temprature: 21 deg. C	Diffuser Diameter: 1.016 m Diffuser Length: 1.0668 m

Robert Hall
Room 511 Forward Building
Phone: 822-0066



Fan Performance Curve	3200-VAX-2100 Full Balde	ReV. 000607-01
Diameter: 0.8128 m Altitude: 0 m Asl Density: 1.201 Kg/m³	Speed: 1460 Rpm Temprature: 21 deg. C	Diffuser Diameter: 1.016 m Diffuser Length: 1.0668 m

Robert Hall
Room 511 Forward Building
Phone: 822-0066



Fan Performance Curve	3000-VAX-2100 Full Balde	ReV. 000607-01
Diameter: 0.762 m Altitude: 0 m Asl Density: 1.201 Kg/m³	Speed: 1460 Rpm Temprature: 21 deg. C	Diffuser Diameter: 1.016 m Diffuser Length: 0.9906 m

Six(25)

a) A combined dust survey and time study is made in a mining stope. The following data are obtained

Start Time	End Time		Operation	Respirable Dust concentration mg/m^3
8:00	8:20	20	Barring Down	1.0
8:20	10:45	145	Scraping	2.1
10:45	11:30	45	Timbering	0.4
11:30	12:00	30	Lunch	0.2
12:00	2:20	140	Drilling	2.9
2:20	3:00	40	Loading Holes	0.3
3:00	3:15	15	Blasting	3.5

Determine the TWA concentration in the stope over the shift and the yearly respirable dust dose that that a person working 220 days per year would be exposed to in the stope

b) If the TLV for this dust is 1.5 mg/m^3 do you need to reduce the dust concentration. If so what methods would you suggest. Why?

Robert Hall
Room 511 Forward Building
Phone: 822-0066

Robert Hall
Room 511 Forward Building
Phone: 822-0066