METC 106   Mid-Term

Name _____Date_____

Score _____ Instructor (Mr. Bell)

1.) Name the 5 Main Branches of Engineering and answer the following questions. (This question may include other engineering branches other than the 5 "Main Branches".)
   Ans _Civil, Electrical, Mechanical, Mining & Metallurgical, Chemical_
   a.) Which type of engineer builds roads? _Civil_
   b.) Which type of engineer designs a part for a fishing reel on a CADD system? _MET_
   c.) Which type of engineer performs time studies? _IET_
   d.) Which type of engineer assists in extracting minerals from the ground? _Mining & Metallurgical_
   e.) Which type of engineer assists in testing a new drug for harmful side effects? _Chemical_
   f.) Which type of engineer maintains and operates a radio station? _EET_

2.) Using the http://www.bls.gov website determine one of the following: salary or expected need for one of the 5 Main Branches of Engineering.
   Chemical Engineer - Mean Salary $94,590

3.) Name the 6 types of Technicians and match their responsibilities.
   Ans _Chemical Engineering Tech., Civil & Architectural Engineering Tech, Electrical/Electronic Engineering Tech., Computer Engineering Tech., Industrial Engineering Tech., & Mechanical Engineering Tech._
   a.)_ChET_ Assists in testing a new drug for harmful side effects.
   b.) _CET_ Assists in constructing bridges.
   c.) _EET_ Assists in operating a microwave system.
   d.)_CpET_ Assists in the troubleshooting and repair of computers.
   e.)_IET_ Assists in the areas of production and quality control.
   f.) _MET_ Assists in the preparation of final assembly drawings.

4.) Using the Occupational Outlook Handbook determine one of the following: salary or expected need for one of the 6 types of Technicians covered in class.
   CET - Mean Salary $47,940

5.) In high school I owned a 150 Honda Dream motorcycle. It had a 154 cc motor with a 49mm bore. The engine of both the early and late model motorcycles is an OHC parallel twin displacing 154 cc with a single carburetor. The engines are linked to a four-speed transmission. Find the total engine displacement in cubic inches and liters. Also find the stroke in mm.

   Stroke = _41_ mm
   Engine Displacement = _9.39_ in^3
   Engine Displacement = _.154_ L

   $V = AS$
   $A = \dfrac{\pi d^2}{4}$

   $V = \left(\dfrac{\pi d^2}{4}\right) S$

   $77 = \left(\dfrac{\pi (49)^2}{4}\right) S$

   $S = .0408$

   $V = 154/2$

   77 per cyl.

6.) Perform the following conversions:
   a.) 25,000 mph to 1.181 km/sec.
   b.) 5'6" to 167.64 cm.
   c.) $3.25 dollars per gallons to $0.86 dollars per liters

7.) Name the seven "Fundamental Units".
   a.) length
   b.) Mass
   c.) time
   d.) Electric current
   e.) temperature
   f.) luminous intensity
   g.) amount of substance

8.) Convert 77K to C°, F° and R° (show all calculations) $K = °C + 273$ $°R = °F + 460$

   77K = -196 C°   77 - 273 = 196 $°C = (°F - 32)/1.8$
   77K = -320.8 F°   -196 = (°F - 32)/1.8   -352.8 = °F - 32
   77K = 139.2 R° $°F = -320.8$
 $°R = -320.8 + 460$

9.) Your boss would like you to determine the Mean, Maximum, Minimum and Standard Deviation of 15 resistors. The resistor values are: 1190, 1100, 990, 1150, 995, 1113, 1020, 1180, 1001, 1101, 1002, 1102, 991, 1151 and 970

   Mean = 1070.4 ✓
   Maximum = 1190 ✓
   Minimum = 970
   Standard Deviation = 77.61793 ✓

10.) Using your calculator or a spreadsheet, create the plot for I=E/R when E=9.0 Volts and R=100,220,330,470, 1K (Calculate each "I or current" value & plot)

R = 100 I = 90.0E-3
R = 220 I = 40.9E-3
R = 330 I = 27.3E-3
R = 470 I = 19.1E-3
R = 1000 I = 9.0E-3
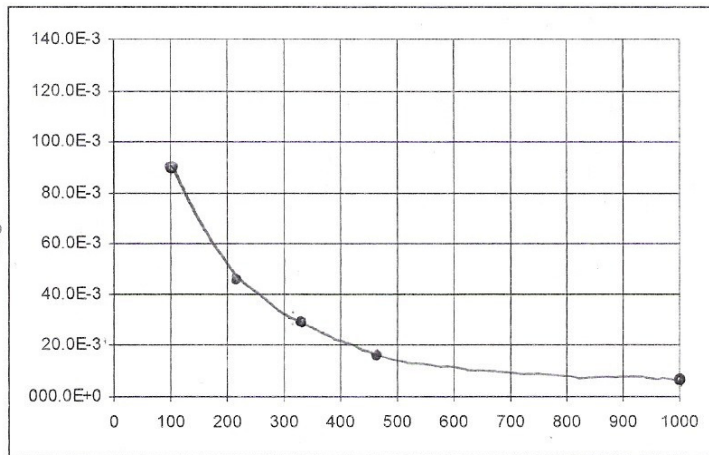
11.) Using your calculator or spreadsheet, create the plot for 2^X as X varies from 1 to 8. (Calculate each value & plot)

$x = 1$ $y = 2$ *good*

$x = 2$ $y = 4$

$x = 3$ $y = 8$

$x = 4$ $y = 16$

$x = 5$ $y = 32$

$x = 6$ $y = 64$

$x = 7$ $y = 128$

$x = 8$ $y = 256$
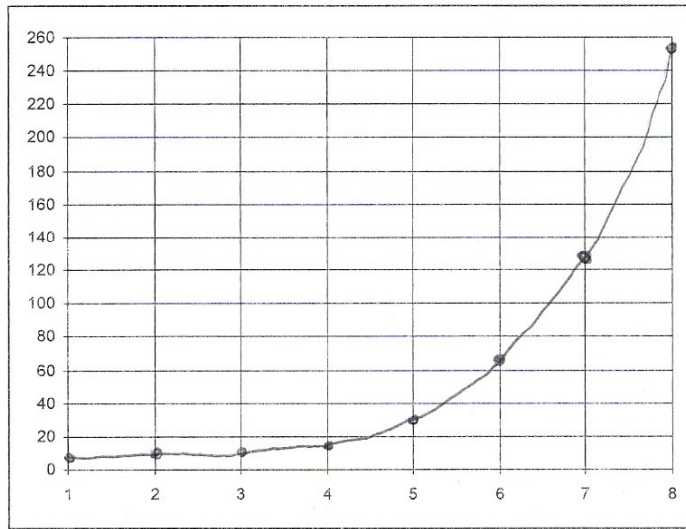
12.) Human hair grows about 2×10^{-5} meters per hour. How many inches of hair growth would there be in a month? How long would it take for hair to grow 12 inches?

.57478 in. per month

20.9 months to grow 12 inches

13.) Divide 6 into the sum of 2 + 5 + 4 and the product of 2 x 5 x 4.

$(2+5+4)/6 = 1.83\overline{3}$ ✓ $(2 \cdot 5 \cdot 4)/6 = 6.6\overline{6}$ ✓

$(2+5+4) + (2 \cdot 5 \cdot 4)/6 = 8.5$

14.) The resistance (R2) of a wire varies according to the temperature (t) as

$$R_2 = R_1[1 + \alpha(t_2 - t_1)]$$

.004 α

The factor (α) is found in tables from engineering handbooks. Alpha (α) varies by material type. Find the resistance of an aluminum wire at 100°C (t2) if the resistance (R1) is 20 ohms at 10°C (t1).

$R_2 = 20[1 + .004(100-10)]$ $= 20(1+.36)$ $= 27.2$ ohms ✓

$= 20[1 + .004(90)]$ $= 20(1.36)$

15.) During class we have viewed multiple iteration of the Tee Shirt Folding (TFD) device. What observations have you made about the device relative to design or engineering?

The designer began with the simplest, cheapest method that solved his problem, then started making & testing improvements to the original design. He is following a set procedure with each change; design, make, then test.