PLEASE ANSWER ANY FOUR QUESTIONS

Q1/ What are the basic components that are used to build a block of automation?
Explain briefly each of them.

Q2./ The component in the Fig. Is to be faced and then turned, write a typical program in word address format for the required moves.

Q3./ The following NC program, (with a missed function), machines an alphabetic letter in a plate clamped on a table, the table surface is at (Z=40 mm), and the depth of the cut is (1 mm):

a/ Assign missing function that should be added to the program to make it work correctly?

b/ What alphabetic is machined using this program?

c/ What is the thickness of the clamped plate?

Q4./ Write a suitable part program with (I & J) to engrave the contour shown in figure below, using a 12 mm end mill. Assume appropriate work piece size, depth of cut, speed and feed. State you assumption clearly. [All dimension on drawing are in mm.]

Q5./ Write down a part program in APT language (geometric and motion statements) to drill the two holes that shown in Fig., assume that the w.p thickness is 10 mm.
Note: 1 Answer Only Three Questions.

Note: 2 All Questions Have The Same Mark.

Q1/ Explain with sketch the interrelationship among design, materials and processing.

Q2/ Compare between:-

A. Effects chromium and molybdenum in steel.
B. Screening of candidate materials and selection of candidate materials.
C. Solid solution strengthening mechanisms and precipitation strengthening mechanisms.

Q3/ 

A. What are the roles of manufacturing and production engineers.
B. List the main properties of ceramics to be considered in design.
C. Sketch the cycle-life of engineering materials.

Q4/ Explain:-

A. What are the selling price including.
B. By using sketch show the behavior of elongation and ultimate tensile stress at slow cooled carbon steel.
C. Analysis of material requirements.
Q1/ Name the machine shown in the fig. below. And briefly explain each of its assigned parts.

Q2/ A shaft of length 400 mm has a taper length of 200 mm. The maximum diameter of taper is 50 mm and minimum diameter is 40 mm. Find:
1. Taper in mm/meter and in degree.
2. Angle of swivelng the component rest of turning the taper on lathe machine.
3. Tail stock set over.

Q3/ Sketch, state and compare up milling and down milling?

Q4/ Write the points to be considered in selecting grinding wheel?

Q5/ Compare among Drilling, Boring and Reaming operations in drilling machine

Good luck
Notes: 1- Attempt only three questions.
      2- The Exam. Mark is 15%.
      3- Marks for each of the following questions are equal.

Q1: In an oblique cutting using turning machine, the chip thickness is measured to be (0.5) mm, the machining parameters are as follows:
Depth of cut = (1.5) mm, feed rate = (0.1) mm/rev, cutting speed = (130) m/min, the geometry of cutting tool is according to American system as:
(8 14 6 45 45 1), calculate:
  a) The shear angle and the chip contraction coefficient.
  b) The shear strain.
  c) Shear speed, chip flow speed using the graphical method only.
  d) The metal removal rate in this case?

Q2: Compare using table between the following cutting tool materials:
  a) Diamond coated carbides and cubic boron nitride.
  b) Coronate and cermets.

Q3: Fill in the blanks with the correct word or value:
  1) The percentage of CVD coated tools are about (.....%).
  2) BUE appears at cutting speeds range ( - ) m/min.
  3) The minimum value of chip contraction coefficient is about (.....).
  4) In HSS type T, the Cr content is (...... %).
  5) The color code of ISO P type carbide tool is (......).
  6) The HPC ceramic tools are classified into: (......).
  7) The preferred conditions for obtaining continuous chip without BUE are: (......).
  8) The dependent variables in metal cutting can be defined as: (......).

Q4: A- Show that:
   \[ \varepsilon = \left( \frac{k+1}{k} \right) \sec \gamma - 2 \tan \gamma \]

B- Explain with a neat sketches the main principles and applications of orthogonal and oblique cutting.

Good Luck
 där ج. شريعة حمورابي.
س 3/ بين كيف ضمن الإسلام حقوق الإنسان من حيث:
- حق الحياة.
- حق المساواة.
- حق المرأة.
س 4/ ما القيم القانونية للاعانات والمبادئ والقواعد التي تصدر من الجمعية العامة للأمم المتحدة ومنها الإعلان العالمي لحقوق الإنسان؟
Answer any THREE questions & state your assumptions and decisions

Question (1): A spherical pressure vessel is formed of 18-gauge (0.05-in) cold-drawn AISI 1018 sheet steel. If the vessel has a diameter of 8 in, estimate the pressure necessary to initiate yielding. What is the estimated bursting pressure?

(5 Marks)

Question (2): A cast aluminum 195-T6 has an ultimate strength in tension of $S_{ut} = 36$ kpsi and ultimate strength in compression of $S_{uc} = 35$ kpsi, and it exhibits a true strain at fracture $\varepsilon_f = 0.045$. For the static loadings inducing the stresses at the critical locations listed below, estimate the factors of safety using the suitable theory.

(a) $\sigma_x = 12$ kpsi, $\tau_{xy} = 3$ kpsi ccw.
(b) $\sigma_x = -4$ kpsi, $\sigma_y = -9$ kpsi, $\tau_{xy} = 5$ kpsi cw.

(5 Marks)

Question (3): A bar of steel has the minimum properties $S_e = 276$ MPa, $S_y = 413$ MPa, and $S_{ut} = 551$ MPa. The bar is subjected to a steady torsional stress of 103 MPa and an alternating bending stress of 172 MPa. Find the factor of safety guarding against a static failure, and the factor of safety guarding against a fatigue failure. For the fatigue analysis use: (a) Modified Goodman criterion. (b) Gerber criterion. (c) ASME-elliptic criterion.

(5 Marks)

Question (4): Two steels are being considered for manufacture of as-forged connecting rods. One is AISI 4340 Cr-Mo-Ni steel capable of being heat-treated to a tensile strength of 260 kpsi. The other is a plain carbon steel AISI 1040 with an attainable $S_{ut}$ of 113 kpsi. If each rod is to have a size giving an equivalent diameter $d_e$ of 0.75-in, is there any advantage to use the alloy steel for fatigue application?

(5 Marks)

Good luck
Q.1 answer (A) or (B)

(A) Define the following:-


(B) Prove that the change of entropy during polytropic process is equal to:

$$\Delta S = m \cdot C_v \cdot \frac{y - n}{n} \cdot \ln \left(\frac{P_1}{P_2}\right)$$

Q.2

A closed container holds two Kg at air inside, the internal energy was calculated over a range of temperature a according to the equation \([u - u_0 = 0.17 (T - T_0)]\), where \((u, u_0)\) is in \((J/Kg)\) at temperature \((T, T_0)\). Find the temperature difference in \(^0\text{K}\), if the heat was supplied to container at rate of \((5 \text{ J/Kg})\).

Q.3

The high temperature of Carnot cycle is \((400 ^0\text{C})\), thermal efficiency is \((53\%)\) and the volume ratio of isothermal expansion process is \((2.8)\). Draw the cycle on P-V and T-S diagrams and Determine:-

1. The low temperature of the cycle,
2. The volume adiabatic expansion ratio,
3. The overall volume expansion ratio.

[Take \(\gamma' = 1.4\)]

Q.4

Atmospheric pressure air at \((1.06 \text{ bar})\) and \((15 ^0\text{C})\) is compressed isothermally to \((14 \text{ bar})\) and after that expanded adiabatically and without friction back to atmospheric pressure. What is the final temperature and specific volume of the air? Calculate also the net work done and the heat exchange with the surroundings, Draw the processes on (P-V) diagram.

(Take for the air, \(R = 0.287 \text{ KJ/Kg} ^0\text{K}, \ C_p = 0.992 \text{ KJ/Kg} ^0\text{K}\))
1. A rod is composed of three segments shown in fig. 1 and carries the axial loads \( P_1 = 120 \text{ KN} \) and \( P_2 = 50 \text{ KN} \). Determine the stress in each material if the walls are rigid.

2. A rigid horizontal bar of negligible mass is connected to two rods is shown in fig. 2. If the system is initially stress-free determine the temperature change that will cause a tensile stress of 60 MPa in the steel rod.

3. A solid steel shaft is loaded is shown in fig. 3. Using \( G = 83 \text{ GN/m}^2 \). Determine the required diameter of the shaft if the shearing stress is limited to 60 MN/m² and the angle of rotation at the free end is not to exceed 4 deg.

4. Show that the stress in a thin-walled spherical shell of diameter \( d \) and wall thickness \( t \) subjected to internal pressure \( p \) is given by \( \sigma = \frac{pd}{4t} \)
Q.1/ A thin tube is subjected to a tensile load has stress-strain curve
\[ \sigma = 250 (0.25 + \varepsilon)^{0.3} \text{ Mpa} \]
The inside diameter is 100 mm and length is 400 mm.
Determine the initial thickness and the final length of the tube when the maximum load is 270 KN.

**5 marks**

Q.2/ A bar of material has yield stress \(Y = 100 \text{ Mpa}\), subjected to tensile test, the stress-strain curve given by \(\sigma = 250 \varepsilon^{0.3} \text{ Mpa}\).
Calculate the redundant work factor \(\varphi\) at maximum stress.

**5 marks**

Q.3/ The cartesian components of stresses at a point are given as below:
\[ \sigma_x = 7, \sigma_y = 6, \sigma_z = 5, \tau_{xy} = 2, \tau_{xz} = -2, \tau_{yz} = 0 \text{ Mpa} \]
Determine the principal stresses

**5 marks**

Q.4/ The sign is subjected to the uniform wind loading.
Determine the stress on the 100 mm diameter supporting post at which yield first occurs with according to Tresca and Von Mises Criterions.

**5 marks**
Attempt three questions and Q2 must be answered

Q1: The following matrix is defined as bellow:

\[
A = \begin{bmatrix}
6 & 9 & 12 & 15 & 18 & 21 \\
4 & 4 & 4 & 4.2 & 4 & 4 \\
2 & 1 & 0 & -1.3 & -2 & -3 \\
-6.9 & -4 & -2.1 & 0 & 2 & 4
\end{bmatrix}
\]

Find what will be displayed if the following commands are executed by MATLAB.
1. \(B = A([1, 3], [2, 4])\)
2. \(C = A(:, [1, 4:6])\)
3. \(D = A([2, 3], :)\)
4. \(E = A([])\)
5. \(F = [\text{floor}(A); \text{round}(A); \text{ceil}(A)]\)

Q2: A cylindrical silo with radius \((r)\) has a spherical cap roof with radius \((R)\) as shown in figures bellow. The height of the cylindrical portion is \((H)\). Write a program in a script file that determines the height \((H)\) for given values of \((r, R\) and \(V))\). Use the program to calculate the height of a silo with \(r = 30\) mm, \(R = 45\) mm, and the volume is 120,000 mm\(^3\). Assign values for \(r, R,\) and \(V\) in the Command Window, then execute the program.

Where:
The volume of the cylinder is given by:

\[V_cyl = \pi r^2 H\]

The volume of the spherical cap is given by:

\[V_{cap} = \frac{1}{3}\pi h^2 (3R - h)\]

And \(h = R - R\cos(\theta)\),

\([\theta]\) can be calculated by \(\sin(\theta) = r / R\)

By using the equations above, the height \((H)\) can be determined.

Q3: The following matrix is defined in MATLAB as: \(C = [2\ 4\ -2\ 9\ 0\ 8\ 5\ 3\ 1\ 6\ 7\ 0\ 0\ -4\ 6\ -9\ 7]\). Write what will be display if the following expressions are executed in Matlab command?
1. \(A = [\text{sum}(C, 2) ; C(:, 4)]\)
2. \(B = [\text{diag}(C) ; \text{diag}(C, -2)]\)
3. \(D = [\text{ones}(2, 4) ; C(2:3, :)]\)
4. \(E = C(3, \text{linspace}(1,2,2))\)
5. \(C(3:4, :) = \text{zeros}(2, 4)\)

Q4: A vector is given by: \(A = [15\ -60\ 8\ -2\ 5\ 4\ -1\ 0\ 0.5\ 3]\). Write a function MATLAB program named as \((\text{Avector})\) using conditional statements and loops to determine and display the sum of the positive elements of the vector, and the sum of the negative elements of the vector, then run the program.
1st Term Examination questions 2011-2012

Notice: Answer only Three equations

Q1: (5mark): The length of workpiece is 200mm drilled by HSS tool. The diameter of tool is 20mm, the depth of cut is 4mm. the cutting speed is 45mmmpm and the feed is 0.7 mmppr. Determine: a) Metal Removal Rate, b) calculate tool life if cutting speed 100mmrpm the tool life become 10 minutes, suppose c=28054.336 and c) min T_pr if material handling time is 5min and tool changing time is 0.5min?

Q2: (5mark): Part produced through six operations. The delay and transport time between each neighboring operation is 3min. the time for inspection after operation B and D is 2min and 4min respectively. Drawing operation sequences according to smallest operation time and calculate total manufacturing time?

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<tr>
<td>E</td>
<td>5</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
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</table>

Q3: (5mark): A- What is production? What is responsibility of manufacturing engineering?  
B- Explain function of production planning and control?  
C- Explain categories of processing operation?  
D- Drawing input/output of manufacturing system?

Q4: (5mark): Factory produced the part A, B and C the cost components are:

<table>
<thead>
<tr>
<th>Component</th>
<th>Part A</th>
<th>Part B</th>
<th>Part C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct material cost</td>
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<tr>
<td>Supplementary material cost</td>
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<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Indirect cost</td>
<td>8</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Quantity</td>
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<td>20</td>
<td>25</td>
</tr>
</tbody>
</table>

The time to produced quantity of part A, B and C is 10, 15 and 12 hour respectively. Five labour working to produce each part, the average wage of each labour to produce part A, B and C is 50, 80 and 120$/h respectively. The gas cost, electricity cost and maintenance cost is 200, 2000 and 1500$ respectively. Determine variable cost, fixed cost, total manufacturing cost, profit and selling price?

Good Luck
Examinations question to 1st term 2011-2012

Answer only four questions:

Q1: The center of the solid circle (original position) shown in Fig.1 is (5,5). The circle was subjected to a reflection transformation about a line passing through the point P_1=(0,5) and inclined at an angle (α) with the x-axis. The new position of the circle after reflection is represented by the dotted line shown in Fig.1. Determine the inclination angle (α) of the reflection line.

Q2: A window is defined as (10,10), (80,60) in the screen coordinate system. Consider a line segment bounded by (10,0) and (90,50), determine:

1. the logical AND of the end points bit code,
2. the visible boundaries of the line segment,
3. the normalization transformation matrix which maps the clipped line segment to the viewport coordinates, (20,10) and (80,50).

Q3: Answer the following questions:

1. The two elements of wire frame models are _______ and _______.
2. The application of solid models are _______, _______, _______, and _______.
3. The geometry of the object defines the actual _______ of its entities.
4. Does the order of operation matter in geometrical transformation? Give an example assuming triangular object.

Q4: For the solid geometry shown in figure (2), construct the required CSG table.

Q5: Verify the Euler formula for a cubic shape of two penetrating holes and no internal shell. List the number of vertices, edges, faces, loops, shells, and holes.
answer three questions only:

Q1)-
A- Calculate the center of pressure of the die component shown in figure 1.

B- a blank of (100)mm diameter, (3)mm thick, made of mild steel of shear strength equal to (500) N/mm² is blanked from sheet strip of width (120)mm. If the speed of press is (70) stroke / min, and the wear land of the die (25)mm. Calculate: Work done and Power of motor required.

Note: Assume that the values of ejecting factor (Ke)=stripping factor (Ks) = blank holding factor (Kb) = (0.2).

Q2)-
A- Design a compound die to produce a washer of (80 x 100), (50 x 80), (50 x 25) mm diameter. if the press stroke is 25 mm, shut height of press 200mm, blank width 120mm, blank thickness 3mm, and shear strength 350 N/mm².

B- Calculate the width of mild steel stock coil (strip), percent of scrap loss, and the number of rows required to produce the best efficiency of layout for blanking circular blank of (50 mm) diameter and (2 mm) thickness and (350 N/mm²) shear strength, if the scrap allowance between blanks and strip edge is (5 mm).

Q3)-
A- Draw an example of
1- method of supporting slender punch.
2- Characteristics of blanked edge
3- multiple reduction twin-gear drive
4- short-run dies: steel-rule dies, Subpress dies, Drop-through dies, Inverted dies,
5- Slide actuation in mechanical presses, ((Crank-shaft, , ,Toggle drive press, Knuckle press, ,Rocker-arm drives, Rack and Pinion press, Screw drive press))

B-
1- What are the various steps in the rupture or fracture of the material are during shearing operation:
2- what are The reasons for using notching method of blanking;
3- what are the Methods of Reducing blanking Cutting Forces
4- what are the Classification of power press according to the methods of actuation’s of slides (mechanism used):
5- what are the differences between the hole edge and the blank edge

Q4)-
A- Complete the following
1- punch shear equal to one-third of stock thickness (t/3) will reduce piercing force- bout--------
2- Die Shear that is equal in depth to the stock thickness or greater is to be called ------
3- In piercing operation die shear is ground on the------
4- dulling of the punch increases the rollover and the burnish depth on the hole wall and increase------
5- The operation which can be used only to make blanks that nest in the layout without waste is to be called------
6- The cutting along a line to produce blanks, with out generating any scrap in the cutting operation is to be called ------
7- An operation in which the individual punch removes a piece of metal from the edge of the blank or strip, is to be called ------
8. A press operation in which a single-line cut or slit is made part way across the strip stock, without removing any metal is to be called

9. Curved surface caused by plastic deformation of the work piece before cutting commenced is to be called

10. The depth of stroke during which the cutting force is exerted, before the metal fracture or breaks away is to be called

11. A press of a straight slided, horizontal lay or frame, knuckle linkage drive mechanism, two point of suspension, double action press 5000 tonnes capacity of the main slide and 600 tones capacity of blank holder having bed size 2000 LR x 1600 FB will be specified as: 

12. The operation that removes the distorted excess metal from drawn shapes is to be called

13. The operation through which the edge of a metal is curled around is to be called

14. The operation of giving impressions of the figure, letters or designs on sheet metal parts is to be called

15. The depth of stroke during which the cutting force is exerted, before the metal fracture or breaks away is to be called

16. The curved surface caused by plastic deformation of the work piece before cutting commenced is to be called

17. In piercing the diameter of the punch point equal to or the thickness of the work material.

18. In perforating the diameter of the punch point is the thickness of the work material.

19. The operation of cutting a sheet metal in a straight line along the length is to be called

20. The operation of cutting a sheet metal through a small length and then bending this cut portion is to be called

B. Design a progressive die to produce the shell shown in fig.2, if the shear strength of metal is 300N/mm², 3mm thickness, 70mm strip width, press stroke 50mm, and shut height 250mm.
1st term examination questions 2011-2012

Note: answer three questions

Q1.

a. find the Laplace transform for the differential equation:

\[ m\ddot{x}(t) + b\dot{x}(t) + Kx(t) = f(t) \]

Where: \( x(t) = \cos 2t \) and \( f(t) = \cos^2 t \)

b. Using the integration method find Laplace Transform for \( f(t) \) and \( \frac{df(t)}{dt} \)

\[ f(t) = \cos 4t \]

Q2. Find the \( \frac{\theta_o}{\theta_r} \) for the block diagram shown in Figure 1

![Block diagram](image_url)

Figure 1
Q3. Find the transfer function \( \frac{E_1(s)}{E_0(s)} \) for the system shown in Figure 2.

Figure 2

Q4. Find the transfer function \( \frac{X_1(s)}{F_3(s)} \) of the two degree of freedom system shown in Figure 3.

Figure 3
السؤال الأول:

الشكل المجاور يوضح صندوق تروس مخترطة، حسب قطر المحاور والتروس، إذا علمت أن قطر أكبر شغرلة 1120mm وقطر أصغر شغرلة 100mm، وكانت أقصى سرعة قطع 12m/min وأقل سرعة قطع 500m/min، والقدرة الحصانية للماكينة 6.5 وأقل عدد أسنان للتروس هو 28 سن.

السؤال الثاني:

الشكل المجاور يوضح صندوق تروس فريزة، حسب قطر المحاور والتروس، إذا علمت أن أقل سرعة قطع 30rpm وأقصى سرعة قطع 1000rpm، وكانت القدرة الحصانية للماكينة 6 وأقل عدد أسنان للتروس 35 سن.

السؤال الثالث:

صمم رياضياً وتخطيطياً عمود مرفق منزلي لتحقيق دوران بزاوية 0° ومسافة 0.75 م مابين الموقع الأول والثاني للالية.

السؤال الرابع:

إحسب مع الرسم تروس التبديل اللازمة لقطع سن لوب، إذا علمت أن عدد دورات المحور القائد هي (47 rpm) وعدد دورات المحور المقابض هي (295 rpm).

(مع تمنياتنا للجميع بالنجاح)
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<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>980</td>
<td>980</td>
</tr>
</tbody>
</table>
Q1: select the correct term among the given choices:

1- Parallax errors are between
   a-scale and division  b-scale and pointer  c-pointer and division.

2- It is necessary to have a measuring system with
   a-maximum numbers of elements  b-moderate number of elements  c-minimum number of elements.

3- Increasing the number of elements in designing a measuring system results in
   a-increased accuracy  b-increased accumulative errors  c-increased compound errors.

4- Sensitivity and range of measuring instrument have
   a-direct relationship  b-Linear relationship  c-inverse relationship

5- Precision is
   a-The repeatability of a measuring process
   b-Agreement of result of a measurement with the value of the measured quantity.
   c-The ability of a measuring device to detect small difference in a quantity being measured.
   d-The ability of an instrument to reproduce same reading under identical conditions.
Q2: Which one of the following sentences is correct or false:

1- Cosine error is found in dial gauges.
2- Measured values are lower than actual in a vernier.
3- Temperature rise gives measurements higher than the actual dimensions.
4- Narrow spacing of the scale readings gives low accuracy in reading.
5- Design errors of measuring systems cannot be prevented.
6- Elastic deformation errors are resulted due to the measuring force on the measuring tool and work piece.
7- Mechanical measuring systems are of higher response than electrical.

Q3:A: Mechanical measuring systems suffer from:

1-
2-
3-
4-

B: To support a rectangular bar, it is to support it by two supports with a certain distance between them. Explain.

C: The principle of an electrical resistance gauge depends on:

1-
2-
3-

Q4: A strain gauge having a gauge factor GF equals 2.0 is mounted on a hollow circular shaft of 60mm outer diameter and 10mm thickness and a length of 300mm as shown. A compressive force of 30kN is applied at the top of the shaft. Determine the resistance change ΔR of the gauge if its resistance is 120 ohm and the steel shaft has a modulus of elasticity E equals 200000N/mm².
Examination questions to 1st term 2011-2012
Note: Answer only three questions

Q1: Choice the correct one or more from the alternative given below against each question.
a- Alternative name of nontraditional machining processes is one of the following:
   (i) New technology, (ii) Modern machining, (iii) Unconventional machining, (iv) all of the above.
b- One of the following processes give accuracy up to (0.01 mm):
i- Ultrasonic machining (USM), (ii) Grinding machining, (iii) Electro discharge machining (EDM).
c- Which zone of tool wear diagram is used to calculate tool wear calculations:
   (i) First zone, (ii) Second zone, (iii) Third zone.
d- One of process is used to change the shape of materials:
   (i) Squeezing, (ii) Boring, (iii) Broaching.
e- Metal removal rate (MRR) in ultrasonic machining (USM) mainly depended in:
   (i) Work material composition, (ii) Amplitude of vibration (a), (iii) Area of tool contact (A).

Q2: Compare between the following statements:
a- Electro chemical machining (ECM) and electro discharge machining (EDM).
b- Traditional and non traditional machining.

Q3: a- In electrochemical machining (ECM) of pure iron a material rate of 300 mm³/min is required, estimate current requirement from the following data:
   ANi=58.71, PNi=8.9, VNi=2, AF=55.85, PF=7.86, VF=2, Ac=51.99, Pcr=7.19,
   if the tool area is 1500 mm² and a current of 200 A is being passed through the cell.

Q4: a- Calculate the cutting forces (Fx, Fy, Fz) during turning operation under the following data and according to table (1) behind paper if work material was structure steel (facing turning) and cutting tool was high speed steel (HSS).
   b- List all parameters which are considered when selecting fixtures.
<table>
<thead>
<tr>
<th>No</th>
<th>Work material</th>
<th>Feature of machining</th>
<th>Tool material</th>
<th>Values of coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tangential force $f_x$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$C_p$ $x$ $y$ $z$ $n$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External and internal turning</td>
<td>Carbide</td>
<td>300 1 0.75 -0.2</td>
</tr>
<tr>
<td>1</td>
<td>Steel structure $aB = 750$</td>
<td>Thread cutting</td>
<td>Carbide</td>
<td>148 0.72 1.7 0.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cutting</td>
<td>H.S.S</td>
<td>200 1 0.75 $x$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Facing</td>
<td>H.S.S</td>
<td>212 0 1 0.75</td>
</tr>
<tr>
<td>2</td>
<td>Grey cast iron HB 190</td>
<td>External and internal turning</td>
<td>Carbide</td>
<td>92 1 0.75 0</td>
</tr>
<tr>
<td></td>
<td>Maliciable cast iron or</td>
<td>External and internal turning</td>
<td>Carbide</td>
<td>81 1 0.75 0</td>
</tr>
</tbody>
</table>
University of Technology
Dept. of Production Engineering & Metallurgy
8/2/2012

Stage and Branch: 2nd class/production
Subject: Statistics
Time: 2 hours
Examiner: Dr. Aseel Hamad

Examination questions of 1st term 2011-2012

Note: Answer three question only

Q1/ The temperature was recorded at noon each day a month construct a frequency distribution and cumulative frequency for the data use five classes and then construct a histogram?

<p>| | | | | | | | | | |</p>
<table>
<thead>
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<td>46</td>
<td>44</td>
<td>51</td>
<td>48</td>
<td>46</td>
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</tbody>
</table>

Q2/ A box contains five red balls, three blue balls and seven white balls. A ball is selected and its color noted. Then it is replaced. A second ball is selected its color noted. Find the probability of each of the following?

a) Selecting three blue balls.
b) Selecting a blue ball and then a white ball.
c) Selecting red ball and then white ball.
Q3/ The scores for 25 students on a 5-points quiz are shown below find the mean, mod and mean devotion?

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
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</thead>
<tbody>
<tr>
<td>0</td>
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<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
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<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

Q4/A/ In a sample of 50 people find the following probability for the Following?

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>22</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
</tr>
<tr>
<td>AB</td>
<td>2</td>
</tr>
<tr>
<td>O</td>
<td>21</td>
</tr>
</tbody>
</table>

a) A person has type O blood.
b) A person has neither type A nor type O blood.
c) A person has type A or type B blood.

B/ How many different permutation can be mad from the letters in the word (statistics) ?
first semester exam

Note: Answer two Questions including the first Question

Q 1/ A- Cite all the types of:
1- Rotating four bar linkages.
2- Mechanical components.
3- Gears according to the type of gearing.

B- Figure (1) shows a surface grinder. The workpiece is oscillated under the spinning (90 mm) diameter grinding wheel by the slider-crank linkage which has a (22 mm) crank, a (157 mm) connecting rod, and a (40 mm) offset. The crank turns at (120 rpm), and the grinding wheel at (3450 rpm). When link 2 normal to the positive X axis (i.e. \( \theta_2 = 90^\circ \)), Calculate:
   1- The velocity of the grinding wheel contact point relative to the workpiece.
   2- The rubbing velocity at the pin A, which is (6 mm) in diameter.
   3- If the crank turns at (2800 rpm), find the acceleration of the grinding wheel contact point relative to the workpiece.

Q 2/ A- What do you understand by “Gear Train”? Discuss the simple and compound gear train with figures.

B- Four masses, at equal radii and rotating in parallel planes, are attached to a shaft. In each of the end planes, spaced a distance of (2b) apart, there is a mass of (12 kg). The inner planes, spaced a distance (2a) apart, are symmetrical with the end planes and each contains a mass of (15) kg. If the masses on the inner planes are at (120^\circ) to each other, Find:
   1- The ratio (a/b), and
   2- The relative angular positions of the other masses, for complete balance.

![Figure (1) – Surface grinder mechanism.](image-url)
A- What do you understand by “Inversion of slider crank mechanism.”? Discuss with figures.

B- A shaft (1.4 m) long carries four eccentric loads A, B, C and D, spaced at (0 m), (0.45 m), (0.75 m), and (1.4 m) from one end. The loads are respectively (7.5 kg), (11 kg), (15 kg), and (6 kg), and eccentricities are (36 mm), (48 mm), (54 mm) and (96 mm). The directions of eccentricities of B, C and D relative to A are (60°), (200°) and (270°). The shaft is carried in bearings E and F, which are (0.175 m) and (1.0 m) from A, E being between A and B.

1- Determine the maximum and minimum vertical forces on bearing F, when the shaft rotates at (90 rpm).

2- What is the maximum speed at which the shaft may run, to ensure that the vertical component of the load on F is always downwards?