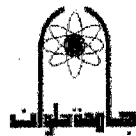
 كلية الهندسة بحلوان	Dept/Division : Mechanical Engineering / Industrial Engineering Academic level: Fourth Course code & title: (MEC 6412) MATERIAL HANDLING SYSTEMS Instructor: Assoc. Prof. Essam Anis and Asst. Prof. Mohamed Abdallah Bhlol Total mark: 100 marks	 جامعة حلوان
	Semester: First 2015/16 Time allowed: 3 hrs	

Assume any missing data

يسمح باستخدام الجداول

Q1 A material handling system is used to convey sand in a sand casting workshop. The system consists of:

- A feeder with a discharge of $150 \text{ m}^3/\text{hr}$
- A chute with spiral length = 25 m, and conveying height = 8 m. The chute conveys 80% of the discharged capacity in 30 sec. The final speed of the sand leaving the chute equal five times the inlet speed.
- A horizontal screw conveyor with 30 m length received the discharged capacity of sand from the chute.

Required:

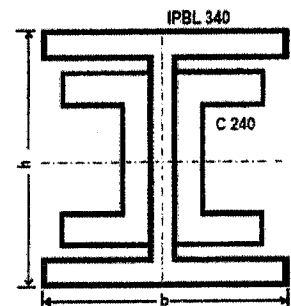
- a) The coefficient of friction between chute and sand.
- b) Full design calculations for the screw conveyor.
- c) Show by sketch the different configurations of screw.
- d) If the conveying material is gravel, what are the predicted problems in chute and screw conveyor?

(25 Marks)

Q2 A) An inclined belt conveyor (trough 20°) is used to convey coal. The conveyor data are:

- Conveyor length = 500 m - lifting height = 20 m
- Belt speed = 5 m/sec - idler diameter = 159 mm - factor C = 1.15
- Assume adverse conditions - belt material is R 250, 5 plies and rubber cover 5:2 - wrap angle $\alpha = 210^\circ$ - $\mu = 0.3$ - weight per meter length = 130 Kp/m
- **Determine:** (1) The Belt width (2) The max. and min. belt tension
(3) The driving power

B) Two C 260 channel sections welded with IPBL 340 to form a built-up column section as shown in Fig. The column length = 8 m, one end of column is pinned and the other is fixed. If the column material is Steel 37 and case of load = 1. Calculate: the maximum allowable compressive force for the column (F) (Mp).



(25 Marks)

من فضلك اقلب الصفحة

Q3 a) What is meant by the ten principles of material handling?

b) Discuss the life cycle cost principle.

c) For a block of pulleys using steel wire rope, consists of 1-fixed and 2-movable pulleys, given the following data: $F_n = 330 \text{ Kp}$, $F_1 = 291 \text{ Kp}$, $\eta_B = 0.93$, draw this pulley block and then calculate: Q , η_p , and F_2 .

(20 Marks)

Q4 a) Make complete design calculations for electric hoist equipment with three falls steel wire ropes, taking into account the following data:

The load capacity = 10 MP, the height = 800 cm, lifting velocity = 2000 cm/min,

no. of cycles/hr = 20, and the motor speed is 900 rpm with sliding bearings.

b) In an AGV delivery system, the total delivery time per vehicle is 10 minutes and the loaded time per delivery is 300 seconds while the empty distance is 75 m. The vehicle is moved by constant velocity of 1.2 Km/hr. Calculate the handling time per delivery. If the system has 7 AGVs find the number of deliveries/hr assuming that the handling efficiency is 50%.

(30 Marks)

Helwan University
 Faculty of Eng.-Helwan
 Mech. Eng. Dept.
 Final Exam in Plant Layout
 14/1/2016
 Time allowed :3 hrs

الإحصاء
 017/1/14
 محمد السيد

Answer all of the following questions:

Question 1(16 marks)

- a)- Define departmental planning and draw a flow chart that would be used as a guide for department selection. (4 marks)
- b)-Explain the factors to be considered in the regional decision stage. (4 marks)
- c)-List the steps of the LSR method. (4 marks)
- d)-Explain the effective flow principle (4 marks)

Question 2(26 marks)

A Company would like to determine where to open new facilities. It supplies its products to five major distributors. The variable production cost is 12 LE/truck, 14 LE/truck, 10 LE/truck, and 8 LE/truck at sites A,B,C, and D respectively. The fixed annual cost would be 40,000 LE at location A, 45,000 LE at locations B, C, and 30,000LE at location D.

Transportation cost for the Company

Proposed Site	Distributors					Annual Capacity (Truck loads)
	1	2	3	4	5	
A	24	18	30	10	30	800
B	25	33	40	23	21	700
C	18	32	23	24	26	900
D	17	26	18	30	23	800
Annual Demand (truck loads)	500	600	300	400	400	

Please do the following:

- a)-Define the decision variables. (6 marks)
- b)-Formulate a 0-1 integer program that can be used to determine where to locate the plants. (10 marks)
- c)-IF $Y_A=1$, $Y_B=0$, $Y_C=1$, and $Y_D=1$, Dtermine the total cost of this Solution (10 marks)

Question 3(10 marks)

A manufacturing facility consists of eight departments (A,B,C,D,E,F,G, and H) and is to produce six components (1,2,3,4,5, and 6). Given the following product routing, production forecasts, and the recommendation that department B should be placed away from departments D, G.

Production forecasts (unit loads/week)	Production Routing	Component
40	A-B-G-E-H	1
25	A-C-D-F-H	2
50	D-A-E-F-G-H	3
50	A-B-D-E-H	4
45	A-B-C-D-H	5
35	B-A-E-F-G-H	6

Do the following:

a)- develop a from-to chart for the facility

(5 marks)

b)-Develop a relationship chart.

(5 marks)

Question 4(24 marks)

Shown below is the relationship between the departments and the space requirements for each department in a manufacturing facility .

a)-Construct the space relationship diagrams. (8 marks)

b)-Design the corresponding block layout using SLP. (16 marks)

	RE	ST	CM	IM	BM	DC	LA	PA	BS
RE	-	I	A	O	O	E	O	I	U
ST		-	U	X	U	U	U	U	U
CM			-	U	U	U	U	U	U
IM				-	U	U	U	U	U
BM					-	E	U	U	U
DC						-	O	U	U
LA							-	I	E
PA								-	A
BS									-
Area in Square feet	3500	300	2000	500	1500	700	3000	600	200

Question 5(24 marks)

A plant consisting of 8 departments. You are given the following:

From	To								Area(square meter)
	1	2	3	4	5	6	7	8	
1		100	40	60	150	45	60	30	400
2	90		150				100	10	600
3	30	50					100		800
4	50	10							600
5	5	5							200
6	40								500
7	15	120	50	10				50	800
8	20						30		400

a)-Develop the activity relationship chart



(8 marks)

b)-Construct a block layout using Appl's procedure.

(16 marks)

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انيس عبد الله
صالحه 11/11/16

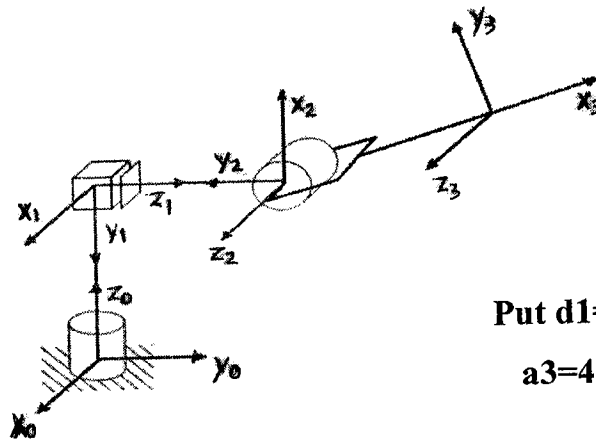
 كلية الهندسة بطوان	Dept/Division : Mechanical Engineering / Industrial Engineering Academic level: Fourth Course code & title: (MEC 6413) INDUSTRIAL ROBOTICS Instructor: Essam Anis M. Abdalla and Mohamed Hamoud Total mark: 100 marks	
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Data sheet is allowable

- Q1 a) What are the geometric configurations of the Industrial Robots (IR)? Represent them and write the kinematic equation for each one.
- b) What are the basic issues that should be resolved before programming the IR?
- c) What is the meant by “**Robot Kinematics**” term?
- d) A moving frame {B}, which is rotated relative to the fixed frame {A} about Z-axis by 30° , translated 10 units in X_A , and translated 5 units in Y_A Find ${}^A P$, where ${}^B P = [3 \quad 7 \quad 0]^T$.

(20 Marks)

- Q2 a) Solve the Forward Kinematics Problem (FKP) for the following manipulator:



Put $d_1=4$, and
 $a_3=4$ units

- b) Solve the IKP for 2DOF planar robot manipulator. If $L_1=L_2=0.8m$ and the end tip moves [from (0.3, 0.5) to (0.4, 0.6)], find the joint variables at the **Start point of this path ONLY**.

(30 Marks)

من فضلك اقلب الصفحة

- Q3**
- What is the benefit of using via-points in planning of robot trajectories?
 - Assuming boundary motion conditions for a robot path and select the time-based function that achieved these conditions, and then find its coefficients.
 - Sketch graphs for the joint trajectories for a 2-segment cubic spline with continuous acceleration. Where $\theta_o = 25\text{deg}$, $\theta_v = 45\text{deg}$, $\dot{\theta}_v = 20\text{deg/s}$, and $\theta_g = 90\text{deg}$. Each segment lasts after 2 seconds.

(20 Marks)

- Q4**
- The productivity per week for sequential loading is 16000 while for parallel is 86000 and the cycle time is 0.15 min. How many machines are there in this cell for one shift?
 - In a milling station a robot loads and unloads the parts. The following are the handling times:
 - Pick up a part from the conveyor = 1.5 s, - Move to m/c = 1.2 s
 - Load into m/c = 0.9 s, - Unload from m/c = 0.9 s - Move to conveyor = 1.2 s,
 - place a part onto conveyor = 0.4 s, the machining time = 16 s.
 Assuming there is 15 % system malfunction in the 2nd shift. Calculate the following:
 - The two shifts production level for double-handed gripper and find the reduction percentage in the production level if one handed-gripper is used.
 - The reduction percentage in volume rate for manual workers, if the manual cycle time is 25 s in 1st shift while it is 27 s in 2nd shift.
 - In a spray painting cell, given the following data:

The manual system:

- Production rate = 70 pc/hr - Maintenance cost = 350 \$/month
- Actual operating time is 5.5 hours for eight hours shift.
- Human cost per hour = 19 \$/hr - no. of workers = 10

The robotic system: (The capital investment is 1.2\$ million)

- production rate = 120 pc/hr - annual cost = 600000 \$/year
- supervision cost = 70 \$/hr - no. of robots = 8
- failures cost = 6000 \$/occurrence - MTBF = 190 hr/robot
- loss of production time = 5 hr/robot/yr.


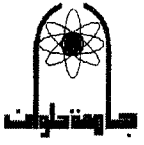
Compare between a manual spray painting and robotic paint sprayers:

- for the annual productivity.
- for the cost/pc.

(30 Marks)

طبيب التعميرات بالتوفيق والنجاح

امير سلطان بن عبدالعزيز
الجامعة التقنية الحديثة
الرياض 11561

 Faculty of Engineering	Dept: Industrial Engineering Instructors: Dr. Mohamed A. Daowd Courses code & title: POW6415 - Electrical Machines Instructions: 4 th year, First term 2015-2016 Total marks: 70 marks Time allowed: 3 hrs	
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Answer the following questions

Question 1:

(20 Marks)

- Explain briefly the different types of electrical transformers. Mention an application for each type.
- Explain briefly the experimental tests used to determine the parameters of a three-phase transformer. Use the machine equivalent circuit in your explanations.
- Explain briefly the use of the power transformers in power transmission and distribution networks. Give an example of a power network includes different types of power transformers.
- Explain the power flow (in graph and relations) of the three-phase power transformer.

Question 2:

(15 Marks)

A single-phase transformer has the name-plate data as follows:

Power: 10 kVA Voltage: 2200/220 V frequency: 60 Hz.

It is desired to determine the parameters of this transformer in order to obtain the machine efficiency-map. Two tests have been experimentally performed in laboratory. These tests have the following data:

Short circuit test: $V_{sc} = 150$ V, $P_{sc} = 215$ W, $I_{sc} = 4.55$ A,

Open circuit test: $V_{oc} = 220$ V, $P_{oc} = 100$ W, $I_{oc} = 2.5$ A,

- Determine the parameters of this power transformer and write these parameters on the equivalent circuit.
- Find the efficiency of this transformer when supplying a load of 0.8 leading power factor and at rated transformer operation.
- Find the efficiency of this transformer when supplying a load of 0.8 lagging power factor and at 50% of rated load.

Please Turn Over



Question 3:

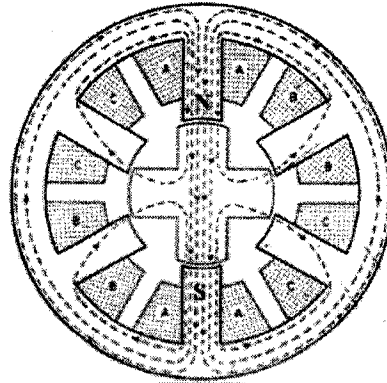
(15 Marks)

- A) Explain the operation of the three-phase induction motor.
- B) What are the different types of the induction machine, and which type do you prefer and why?
- C) Three-phase four poles, 480 V, 60 Hz, 50 hp, induction motor is drawing 60 A at 0.85 PF lagging. The stator copper losses are 2 kW, and the rotor copper losses are 700 W. The friction losses are 600 W, the core losses are 1800 W. Find the following:
1. The air-gap power P_g .
 2. The output power P_{out} .
 3. The motor efficiency.
 4. Electrical torque.
 5. Shaft torque.

Question 4:

(20 Marks)

- A) The below figure shows a stepper motor stator/rotor cross-section. Determine the motor step-angle?



- B) Mention the advantages, disadvantages of the stepper motor and give some of its applications.
- C) Compare between the different types of the stepper motors, you may use these viewpoints: constructions, advantages, disadvantages, common step size, applications ... etc.

مع أطيب تمنياتنا لكم بالنجاح والتوفيق