Tanta University

Faculty of Engineering

Department of Mech. Power Engineering

Year: Fourth Subject: Hydraulic Machines (A)

Name: Z.M. Omara

Date: -1-2011

Time allowed: 3 Hours

Full Marks : 100

Final Exam: pages 2

Academic Number: MEP4103

Question 1

(marks 25)

1- a)) Explain, starting the centrifugal pump, pump model and similarity considerations, pump selection and inlet and outlet piping of a centrifugal pumps.

1- b) Draw sectional view of a centrifugal pump giving the name of its main parts? And explain the working mechanism of a centrifugal pump?

1- c) The impeller of a centrifugal pump has back ward at facing blades inclined at 30o to the tangent at impeller outlet. The blades are 20 mm in depth at the outlet, the impeller is 250 mm in diameter and it rotates at 1450 r.p.m. The flow rate through the pump is 0.028m3/s and a slip factor of 0.77 may be assumed. Determine the theoretical head developed by the impeller, and number of impeller blades.

Question 2

(marks 25)

2- a) What is meant by priming? Explain some of the important methods of priming?

2- b) Discuss the effect of the following parameters on the performance of rotodynamic pumps: a- Pre-whirl inlet velocity. b- Rotational speed.
c- Direction of rotational speed. d- Blade outlet angle.

2- c) Explain how can one derive the performance characteristic curve for a given rotodynamic pump in practice ?

2- d) A centrifugal pump running at 1000 rev/min gave the following relations between head, overall efficiency and discharge:

Q(l/s)	0	5	10	15	20	25	30
Hm	22.5	22.2	21.6	19.5	14.1	10	0
η %	0	26	48	66	78	74	52

The pump is connected to a 300 mm suction and delivery pipe the total length of which is 69 m and the discharge to atmosphere is 15 m above sump level. The entrance loss is equivalent to an additional 6 m of pipe and friction coefficient is assumed as 0.024.
Calculate: 1- The discharge in m3/min. 2-Overall efficiency 3-Manometric head
4- Shaft power at the operating point
It is required to adjust the flow to one half of its original value by:
1- Regulating the pump speed, estimate that speed.
2- By using a throttle valve:
a- Find out the % shaft power lost in the valve? b- Draw the new system curve.

Question 3 **(marks 25)**

3- a) Explain, effect of number of blades and viscosity on performance curves of centrifugal pumps

3- b) State the difference between a closed, semi-closed and open impeller.

3- c) Draw an accurate section of an axial flow pump indicating the flow direction. What are the functions of upstream and downstream vanes? What is an application for axial pump?

3- d) To predict the performance of a large centrifugal pump, a scale model of one-fifth size was made with the following specifications: P=30KW, H=8m, N=1000 rpm if the prototype pump has to work against a head of 25m. Make calculations for its working speed, the power required to drive it and the ratio of the flow rates handled by the two pumps.

Question 4 **(marks 25)**

4- a) Explain types of stuffing box?

4- b) What do you understand by cavitation? What are its causes and how it can be prevent. Draw the performance curves of a centrifugal pump under cavitation conditions and explain NPSH of a centrifugal pump.

4- c) Cavitation test were performed on a pump giving the following results : Q = 0.05 m^3/s, H = 37 m , barometric pressure 760 mm of mercury, ambient temperature 25 °C, cavitation began when the total head at the pump inlet was 4 m . Calculate the value of thoma cavitation coefficient and NPSH.

What could be the maximum height of this pump above water level if it is to operate at the same point on its characteristic in the ambient condition of the barometric pressure of 640 mm of mercury and temperature of 10 °C?

Tanta University
Production Eng & Design Dept.
Time 3 hrs

ميكانيكا نوى (...)

Faculty of Engineering
Industrial organization
Jun 2011

Q1: a- In Aggregate production planning what is the costs should be considered.

b- The mobile company is constructing an aggregate plan for the next 12 months. Although several types of mobiles are brewed at the plan and several container sizes are countered, management has decided to use one mobile as the aggregate measure of capacity. The demand for mobile over the next 12 months is forecast to follow the pattern in table -1. Notice how this demand usually peaks in the summer months and is decidedly lower in the winter. The management of the hefty brewery would like to consider three aggregate plans (***Level work force, Level work force plus overtime*** and ***Chase strategy***). Evaluate these strategies where management has collected the following cost and resource data;

1	2
Month	sales forecast (demand)
Jan	200,000
Feb	210,000
Mar	280,000
Apr	400,000
May	300,000
Jun	500,000
Jul	260,000
Aug	400,000
Sep	350,000
Oct	400,000
Nov	250,000
Dec	230,000

a) Each worker can produce 800 mobile per month on regular time. On overtime, the same production rate is assumed; but overtime can be used for only three months during the year.

b) Each worker is paid 2000 $ per month on regular time. Overtime is paid at 130 percent of regular time. A maximum of 30 percent overtime can be used in any of the four months.

c) It costs 400 $ to hire a worker, including screening costs, paperwork, and training costs. It costs 300 $ to fire a worker, including all severance and benefit costs.

d) For inventory valuation purposes, mobile costs 1.25$ to produce. The cost of carrying inventory is assumed to be 2.7 percent month (or 2.7 cents per mobile per month)

e) Assume the starting inventory is 100,000. The desired ending inventory, a year from now, is also 100,000. all forecasts demand must be met no stock outs are allowed.

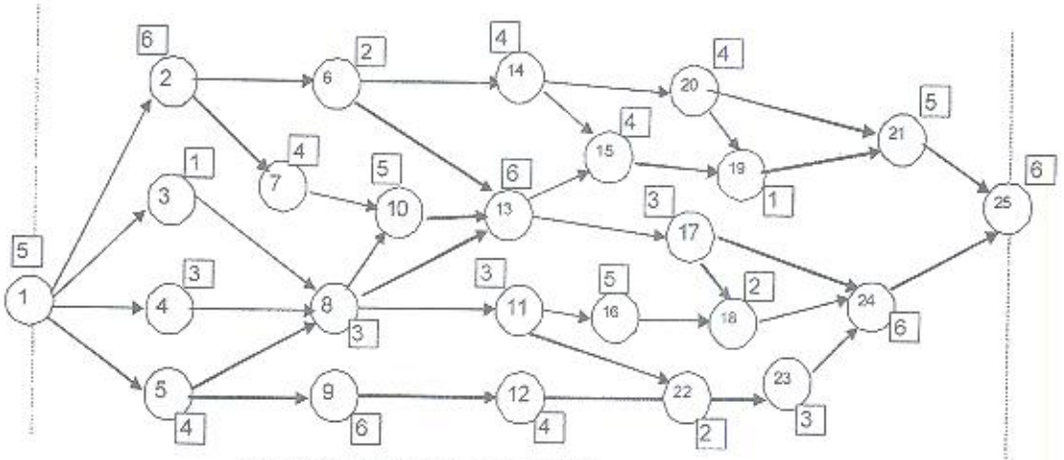
Q2. a- Discuss the different types of production lines.

b- in the presented precedence diagram, Use Ranked positional weight technique to design the assembly line with its work stations and balance delay. Change the cycle time, estimate the number of stations to get the Min balance delay

Tanta University | **Faculty of Engineering**

Production Eng & Design Dept. | **Industrial organization**

Time 3 hrs | **Jun 2011**



Precedence diagram of an assemply line

3: the heuristic procedure for resources scheduling is demonstrated on a case study project with twenty activities and six resources. The case study including activities, resources requirements and daily limits on the six resources .Construct the activities network, define critical path, estimate project duration with considering the resource limits and indications of eligible activities with its finished time on its stations.

No	Activity	Duration	Predecessor	Resource requirements per day					
				R1	R2	R3	R4	R5	R6
1	A	6	–	5	2	2	2	7	4
2	B	6	–	3	5	2	3	9	6
3	C	4	A,B	2	4	4	2	3	1
4	D	6	–	5	4	3	5	5	4
5	E	7	B,A	3	5	2	3	8	0
6	F	5	C	4	1	4	9	2	5
7	G	5	D	4	1	4	3	9	8
8	H	2	A,D	5	5	4	0	9	1
9	I	2	C,H,G	3	2	4	3	4	2
10	J	6	L,F,K	1	5	4	6	7	3
11	K	4	E,C	3	3	2	4	5	1
12	L	6	C,E,H	3	2	2	8	3	4
13	M	4	I,L	2	2	2	2	4	8
14	N	5	K,L	1	4	4	3	4	1
15	O	3	L,I	5	5	4	6	2	3
16	P	5	J,N,O	3	2	3	4	7	8
17	Q	8	N,O,M	4	5	4	2	3	4
18	R	3	O,M	5	3	3	3	7	8
19	S	6	P,Q,R	2	4	6	2	3	4
20	T	3	P,Q,R	1	6	2	7	5	2
	Daily Resources Limit			6	8	8	9	12	12

مع التمنيات بالتوفيق

د.م/ احمد القصاص

Tanta University

Department: Mechanical Power Engineering
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Advanced Ref. and Air Conditioning	Course Code: MEP4127	Year: 4th
Date: Jan. 26th 2011 (first term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (Answer the following questions, assume any missing data, answers may be supported by sketches), Tables of ref. and air conditioning and tables of ref. equipment and design data are ONLY allowed (available with students).

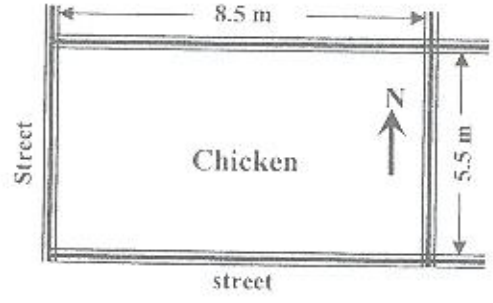
Problem number (1) (35 Marks)

a) Define the cold store and mention their types and the main considerable points when starting to design a one. **(5 Marks)**

b) The shown figure is a plan of a single floor of a house at **Tanta**. It is required to design cold store room of 8.5 m×5.5 m×5 m to store **chicken**. Perform a complete detailed design for the room, provided with a layout of the unit using R-22 as a refrigerant. The following items should be taken into considerations:

- Type of storing is long.
- Storing rate is 10 %
- The room is used 10 months per year
- Cork bard can be used as insulation material. The cubic meter of this insulation costs 300 L.E. for buying + 150 L.E. for fixing. Its supposed age can be considered as 20 years.
- There are three workers.

(30 Marks)



Problem number (2) (17 Marks)

a) Describe in details each component of the most popular method in ice manufacture. **(7 Marks)**

b) Mention why we use the defrost systems, and how it can be controlled? **(3 Marks)**

c) What is the hybrid desiccant air conditioning system? Comparing between it and a vapour compression system with terminal reheat (using psychrometric chart). **(7 Marks)**

Problem number (3) (15 Marks)

a) What are the fundamental components of a closed hydronic system? Show with sketches two different types of hydronic system layout and sketch the pressure drop diagram of each type. **(8 Marks)**

P.T.O.

b) What is the maximum pressure rise if water flowing at 3 m/s is stopped instantaneously? How could you reduce the effect of water hammer? **(2 Marks)**

c) How could you classify the air handling units? **(5 Marks)**

Problem number (4) **(18 Marks)**

a) Mention in details the main components of an air handling unit. **(8 Marks)**

b) The sensible and latent heat gain of a hall is 24 kW and 6 kW, respectively. The hall is to be maintained at 26°C db and 50% RH. A rate of 1 m^3/s of outdoor air at 40°C db and 25°C wb is to be mixed with 1 m^3/s of return air. Part of the air mixture is passed through a cooling coil and the rest is by-passed beyond the cooling coil. Assuming that air leaves the cooling coil at 90% RH. Find the capacity of the cooling coil in TR. **(10 Marks)**

,,,,,,With the best wishes,,,,,,

Course Examination Committee:

Dr. Eng. Mohamed Mahgoub Bassuni

Tanta University
Faculty of Engineering
Mechanical Power Eng. Dept.
Fourth Year

Semester Final Exam
Elective Course(3)– Fuel Systems
January 12, 2011 - Time: 3 hours
Full Mark: [85]

Answer the following questions. Assume any necessary assumptions. Mark

1. a) Define each of the following: [18]
   i) Burner port loading, ii) Combustion intensity,
   iii) Wobbe index, iv) Coal grade.
   b) Explain briefly hydrocarbon molecular structure groups..
   c) Discuss briefly analysis and testing of solid fuels.

2. Discuss briefly each of the following items: [15]
   a) Characterization of liquid fuels.
   b) Gasoline specifications.
   c) Alternative liquid hydrocarbon fuels.

3. Explain each of the following: [15]
   a) Types of gaseous fuel burners.
   b) Spray characteristics and their importance in liquid fuel combustion process.
   c) Types of stoker fired boilers.

4. Using simple illustrations, explain each of the following: [15]
   a) Liquid fuel-oil supply and distribution system.
   b) Stability diagram for single-port gaseous fuel burner of a premixed flame.
   c) Types of Diesel engine fuel injection nozzles.

5. Describe briefly each of the following: [12]
   a) Advantages of suspension burning over fixed bed combustion systems.
   b) Types of fluidized bed combustion systems.

6. Suppose that a power plant operates at an average annual load (متوسط حمل سنوي) of 100 MW and the overall thermal efficiency 30%. If the plant operates 7500 hours/year and uses natural gas with net calorific value = 35 MJ/m^3, where fuel unit price = 0.5 LE/m^3 - (at normal pressure and temperature), estimate the cost of the used fuel per year. [10]

Good luck,

Prof. Dr. S. H. El-Emam