Tanta University - Faculty of Engineering

Department of Production Engineering and Mechanical Design

Final Exam of **Composite Materials** (MDP4128) for	Total Marks: **75**
4th Year Production Engineering and Mechanical Design	Time allowed: **3** hrs
Date: 03 Jan 2018	No. of pages: **2**

Answer all the questions. Neat sketches and clear examples are considered a part of your answer

Q1: Select the most correct answer [24 marks]

1. Fiber yarns are composed of (twisted filaments || twisted filaments || roving || woven roving). They are generally distributed in mass unites called (tex || CSM || CRM || g/km^2).
2. Drapability denotes the ability of a woven fabric (fill the mold || infiltrate fibers || conform to mold's contour || consolidate). It is (improved || increased || reduced || not affected) by application binders.
3. Dimensional stability of a composite is improved by reinforcing them with (particulate || long || short || discontinuous) fibers.
4. Consolidation of composites during their fabrication: a) increases f_r b) decreases f_r c) increases f_m d) decreases f_m e) both a and c f) both a and d
5. In vacuum molding fabrication technique a porous layer of felt is used to improve (infiltration || consolidation || surface quality of products || polymerization).
6. Pressure vessels made from PMCs are best fabricated by (compression molding || depression molding || premix injection molding || filament winding || pultrusion) technique.
7. Forming die in pultrusion lies (before || within || after) the cure chamber, whereas the pre-shaping die lies (before || within || after) the cure chamber.
8. The bending strength of a sandwich composite is mainly afforded by the facing. (True || False)
9. Foams, wood, and stretched honeycomb aluminum are common materials for the core of the sandwich structure. (True || False)
10. Cutting a hole in a CMC is best accomplished by the (AWJ machining || electric discharge machining || laser cutting || end mill || electrochemical machining).
11. Thixocasting of MMCs is performed at temperature (T> liquidus || T<liquidus || liquidus>T>solidus || T<solidus).
12. Tension failure of fastened laminated composite joints is more likely to occur if most of fiber plies are aligned at an angle of (0° || -45° || 45° || 15° || 90°) to the load direction.
13. The strength of recycled reinforcement of a PMC (increases || decreases || is unaffected) by recycling.
14. (Mosses || bone || ice || plywood) is an example of natural composites.
15. MMCs exhibit isotropic mechanical response. (True || False)
16. The inherent damping of composites is owed to the (spring action || interface || soft matrix || hard reinforcement || none of these).
17. Carbon black is used in reinforcing (brake disc || CMCs || rubber || power transmission conductors).

18. (Cermets || Alumina || AVIMID® || Concrete) belongs to CMCs.

19. The maximum working temperature of the high temperature resins is (192 || 300 || 480 || 600)°C.

20. Glass transition temperature is known for (polymers || thermosets || thermoplastics || none of them).

21. During oxidation stage of manufacture of carbon-fibers tension is applied to fibers to:
    (a) increase their plasticity (b) prevent their shrinkage (c) enhance fibers' strength
    (d) a and b (e) a and c (f) b and c

Q2: [6+4+3+5+4= 22 marks]

a) Fabrication of PMCs an only be conducted within the 'process window'.
What is this term refers to? How process window is determined with respect to infiltration, curing temperature, and heat evolution? (Support your answer with correlations and diagrams).

b) Making the brake disc of composites have great advantages. Clarify that with two examples; one for particulate reinforcement and one for fiber reinforcement.

c) Discuss the influence of various fluid environments on the performance of the composites.

d) List the 10 steps of damage repair (use sketches when necessary).

e) Why recycling composites is an important issue? Give short notes about recycling MMCs.

Q3: With the aid of neat sketches explain: [6+5+3= 14 marks]

a) One technique for fabrication of PMCs by i) injection molding and ii) revolution molding. Give an application/advantage for each.

b) Ultrasonic machining of composites: the technique, the advantages and limitations.

c) Development of failure different modes in single and double adhesive joints.

Q4: [5+4+6 = 15 marks]

a) Describe the concept of the minimum and the critical fiber contents in fiber-reinforced composites.

b) Find the critical volume fraction of glass fibers (fracture strength= 1.9 GPa) needed to reinforce epoxy resin (tensile strength = 80 MPa, yield strength = 60MPa). What would be the composite strength with critical volume fraction of fibers?

c) For a continuous unidirectional fiber-reinforced composite, the moduli of elasticity in the longitudinal and transverse directions are 52 and 5.57 GPa, respectively. If the volume fraction of fibers is 0.4, determine the moduli of elasticity of fiber and matrix.

Best wishes,

Assoc. Prof. Mahmoud Ahmadein

علم القياس ٤ هندسة إنتاج

Tanta University – Faculty of Engineering
Production Engineering & Mechanical Design Department
Final Term Exam (90 Marks)

Course Title: Metrology
Course Code: MPD4126
Year: 4th Production Eng. Students

Date: 6/1/2018
Allowed Time: 3 Hrs.
No. of Pages: 2

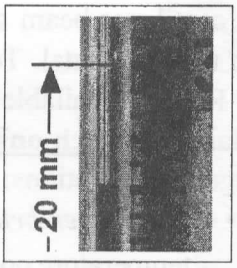
Answer all the following questions –Neat sketches are appreciated

Question 1: **[20 Marks]**

a- Define the following terms: ***range***, ***resolution***, ***true value***, ***reproducibility***, and ***reading***.
b- What are the main disadvantages of measuring surface finish using stylus?
c- A $\Phi 45^{+0.05}_{-0.03}$ mm hole was drilled in a steel work piece. If the hole tolerance will be checked by a plug gauge,
- Find the nominal dimension and suitable tolerance values for both Go and No-go sides of the plug gauge. (***consider the wear allowance***)
- For both Go and No-go sides and with the aid of sketch, assign the tolerance values with respect to the nominal dimensions according to the *unilateral* and *bilateral* tolerance systems.

a- Figure (1) shows a portion of a liquid-in-glass thermometer's scale. If the shown thermometer has a linear scale (equal divisions) in degree Celsius (°C),

Determine:
- The resolution of the thermometer.
- The sensitivity of the thermometer.
- The standard uncertainty due to resolution.



Question 2: **[20 Marks]**

a- Show by **sketch only**:
- The practical pressure thermometer.
- The construction of the resistance thermometer.
- The construction of the strain gauge.

b- Draw the relations among *absolute*, *gage*, and *barometric* pressure.
c- A $\Phi\ 30^{+0.00}_{-0.10}$ mm shaft was manufactured on a center-lathe machine. At the inspection stage, the final turned diameter was measured using a digital caliper to check its compliance with the specified tolerance. The measurement procedure was repeated 10 times, and the readings were as listed below. If the caliper's resolution is 0.01 mm and its calibration uncertainty is 0.15 percent of the reading with confidence level 95%
- Estimate the uncertainty budget and summarize it in the tabular form.
- With the aid of a neat sketch, show the compliance of the product with the specified tolerance.

i	1	2	3	4	5	6	7	8	9	10
Φ (mm)	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00

 تابع بقية الأسئلة خلف الصفحة

Question 3: **[15 Marks]**

a- Show by **sketch only**: **(1)** The Dead-weight tester. **(2)**The LVDT. **(3)** The Inclined-type manometer.

b- Illustrate with a neat sketch the usage of comparator in determining the precise diameter of a plug gauge.

c- How reference junction compensation can be achieved experimentally in laboratory?

d- What are the advantages and disadvantages of thermocouples?

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Question 4: **[15 Marks]**

a- Illustrate with neat sketches the purpose of connecting thermocouples in series and in parallel.
b- What are gauge blocks? List different classes of it.
c- How the range of the liquid-in-glass thermometer can be raised?
d- What is the working principle of the bimetal temperature-sensing elements?
e- Differentiate between Error and Uncertainty.

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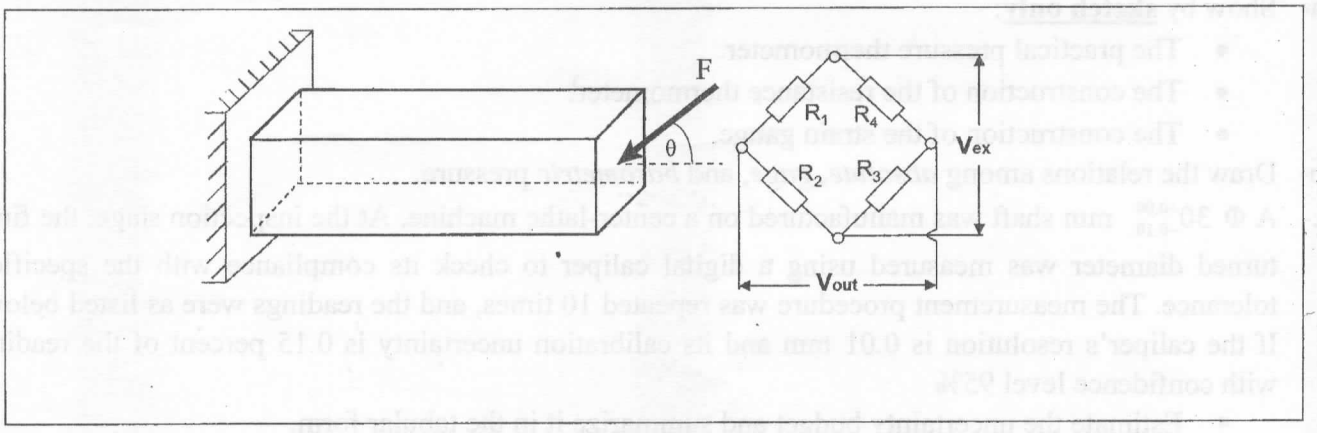
Question 5: **[20 Marks]**

a- List with the aid of a neat sketch the basic types of strain gauge rosette.

b- The cantilever beam shown in figure (2) is subjected to an inclined force **F** that make an angle θ with the horizontal. To measure the strain on the beam, four identical متماثل strain gages (R_1, R_2, R_3, and R_4) are available at your disposal تحت تصرفك. By using the correct number of strain gages, explain **by sketch only** how these strain gages can be positioned on the beam to form the following bridge configurations:

- A *quarter-bridge*, sensitive to the both components $F\cdot\cos(\theta)$, and $F\cdot\sin(\theta)$ (with temperature compensation).
- A *half-bridge*, sensitive to the component $F\cdot\sin(\theta)$ only.
- A *full-bridge*, sensitive to the component $F\cdot\cos(\theta)$ only.

Note: consider the electrical arrangement of strain gages shown in figure (2)



With my best wishes *Dr. Eng. Maher . R. Elsadaty*

رابعة _ انتاج

Tanta University

Department: **Production Engineering and design**

Faculty of Engineering

Total Marks: **85 Marks**

Course Title: **Industrial Organization**	Course Code: **MPD4124**	Year: **4th Prod Eng Dept**
Date: **10-01-2018**	Allowed time: **3 Hrs**	No. of Pages: **(1)**

اجب عن الأسئلة التالية موضحا اجابتك بالرسم التوضيحى كلما أمكنك ذلك... (درجات الأسئلة متساوية)

السؤال الأول:(١٥ درجة):-

ا- ما الفرق بين الانتاج والانتاجية؟وما أهمية الانتاج وما عناصره؟ وما أهمية الأنتاجية وما هى العوامل المؤثرة على الأنتاجية؟.

ب- ما الفرق بين مصطلحى ادارة الانتاج وادارة العمليات؟و" تهدف ادارة الانتاج وادارة العمليات فى المنظمة الى تحقيق جملة من الأهداف" - اذكرها ؟.

ج- ما هى انشطة ادارة العمليات العشر مع التعريف؟ وما هى أهم التحديات التى تواجه ادارة العمليات للانتاج حاليا؟.

السؤال الثانى:(١٥ درجة):-

ا- اذكر ما العوامل التى تتحكم فى اختيار موقع المشروع الصناعى؟ وما اساليب(طرق) اختيار موقع المشروع؟.

ب- اشرح باختصار نبذة عن الخدمات الصناعية التسع؟ و عرف ثلاثة منها وبين اهميتها لأقسام المصنع؟.

ج- ماالمقصود بتخطيط الأنتاج فى المشروعات الصناعية؟ واذكر الاعتبارات الواجب مراعاتها عند التخطيط الداخلى للمصنع؟.

السؤال الثالث: (١٥ درجة):-

ا- اشرح طريقتين من طرق الادارة الصناعية مع ذكر عيوب و مزايا كلا منها.

ب- عرف الاجر؟ وما هى العناصر التى تؤثر فى تحديد الأجر؟ وما هى طرق دفع الأجور (الرواتب) ؟.

ج- ما هى دورة الأنتاج و التسهيلات؟ مع توضيحها باختصار ان أمكن؟.

السؤال الرابع: (١٠ درجات):-

ا- ما الفرق بين الانتاجية الكلية والانتاجية الجزئية (وأذكر أمثلة لهما) وما أهمية قياس كل منها ؟.

ب- حدد مفهوم كل من (الطاقة الانتاجية، الطاقة التصميمية، الطاقة الفاعلة، الطاقة الفعلية)؟.

ج- أذكر باختصار العلاقة بين الانتاجية والعمالة والمهارات و التنمية؟.

السؤال الخامس:(١٥ درجة):-

ا- من البيانات التالية لمجموعة من الالات المتماثلة والتى حملت بانتاج معين:-

١ - عدد أيام العمل السنوية = ٣٠٠ يوم. ، ٢ - متوسط عدد الورديات = ١.٥ وردية. ، ٣ - عدد ساعات الوردية = ٧ ساعات.،

٤ - وقت التشغيل المخطط للمنتج الواحد = ٥٩ ساعة. ، ٥ - عدد الالات المضافة: ٨ فى أول يوليو، ٤ فى أول أكتوبر.

٦ - عدد الالات أخرجت من الأنتاج = ٦ آلة فى أول أبريل. ، ٨- عدد العدد المستخدمة = ٤٠٠٠ وحدة.

٩ - المعاملات ٨٥ لاسستغلال الوقت، ١.١ لتحقيق الأماميات. ، ٩ . لصلاحية الأمامية، ١.٣ للتقدم فى تحقيق الأماميات.

١٠ - العمر الأنتاجى للعدة القاطعة = ٥٠ ساعة.

والمطلوب حساب:-

ا- عدد الالات أول العام. ب- الوقت الأمامى الكلى للمنتج الواحد. ج- معامل الحوادث..

السؤال السادس:(١٥ درجة):-

يوضح الجدول التالى الأنشطة اللازمة لتنفيذ أحد المشروعات، والزمن اللازم لتنفيذ كل نشاط.

النشاط	مسار النشاط	الزمن
أ	١ - ٢	٥
ب	٢ - ٣	٦
ج	٢ - ٤	٤
د	٣ - ٤	٣
هـ	٤ - ٦	٧
و	٤ - ٥	٤
ز	٣ - ٦	٦
ح	٥ - ٦	٢
ط	٥ - ٧	٣
ى	٦ - ٧	٤
ك	٧ - ٨	٣
ل	٦ - ٨	٥

والمطلوب:- (١) رسم شبكة أعمال المشروع التى توضح خطوات تنفيذ المشروع؟.

(٢) تحديد المسار الحرج ووقت تنفيذ المشروع؟.

(٣) حساب الوقت المبكر والوقت المتاخر و الراكد (الفائض) لكل نشاط؟.

(Solve as you can)!![Dr.Eng.: Alaa-Eldin El-Hammady]

مع أجمل التمنيات بالتوفيق والنجاح............

رابعة انتاج

TANTA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF: **Production Engineering & Mech. Design Dep.**

EXAMINATION (4 YEAR) STUDENTS OF Production ENGINEERING

COURSE TITLE: CNC التحكم العددي في ماكينات التشغيل			COURSE CODE: PMD4130
DATE: 13- 1-2018	TERM: First term	TOTAL ASSESSMENT MARKS: 75	TIME ALLOWED: 3 HOURS

Notes:

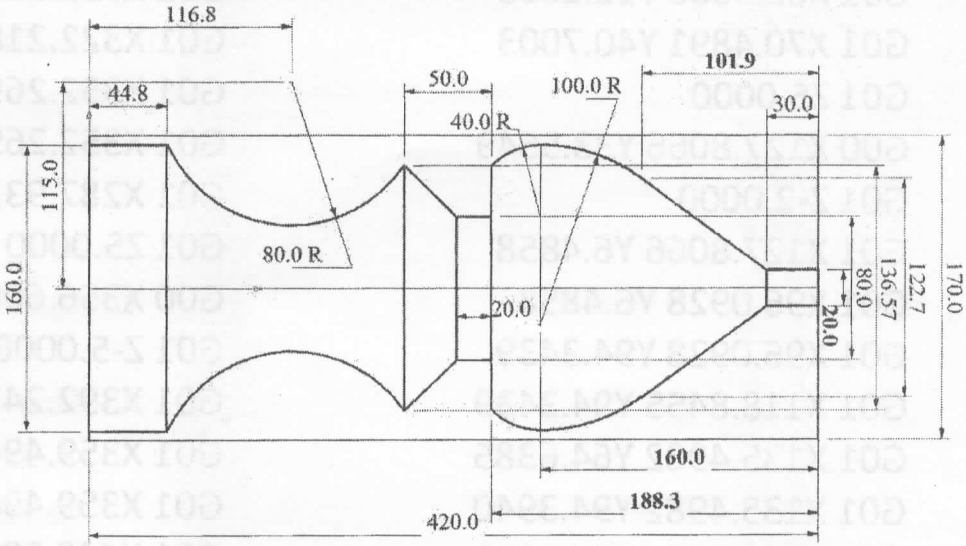
Systematic arrangement of calculations and clear neat drawings are essential.

Any data not given is to be assumed – Answer as many questions as you can. Answer as brief. as possible.

Question One (10%):

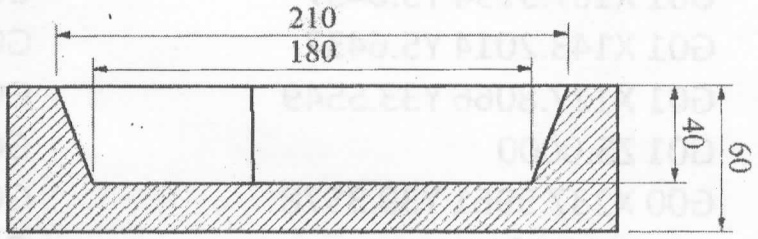
a) Writ done at least 5 advantages and 3 disadvantages for the CNC machine? (5%)

b) With drawing show, the axes of different CNC machines? (5%)



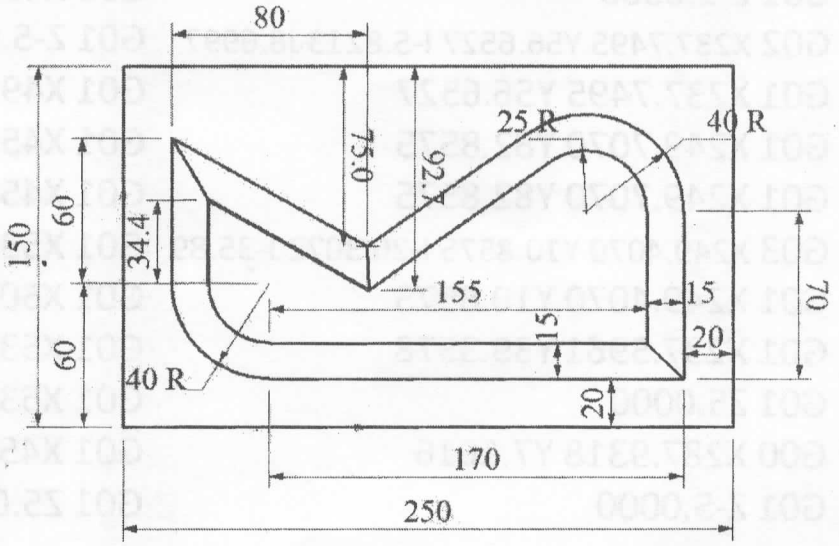
Question Two (50%):

It is required from you to write done the G code to produce the shape shown it the figure beside using a CNC lathe machine. Use cutting depth 1mm, finish depth 0.5mm and rotating speed 3000RPM. Draw the shape of the toll you use.



Question Three (50%):

It is required from you to write done the G code to produce the shape shown it the figure beside using a CNC milling machine. Use cutting tool diameter 10 mm with rotating speed 3000 RPM. Write only the first, the middle and the last finish bath using a depth of 1 mm in each bath.



Question Four (20%): Draw the G code below with scale

G90
G01 Z5.0000
G00 X70.4891 Y40.7002
G01 Z-2.0000
G02 X70.6424 Y57.9951 I-5.8213 J8.6998
G01 X82.6000 Y84.2000
G03 X82.3000 Y12.2000 I-26.3072 J-35.89
G01 X82.3000 Y12.2000
G01 X70.4891 Y40.7003
G01 Z5.0000
G00 X127.8066 Y33.5549
G01 Z-2.0000
G01 X127.8066 Y6.4858
G01 X96.0928 Y6.4858
G01 X96.0928 Y94.3439
G01 X118.8455 Y94.3439
G01 X135.4982 Y64.6385
G01 X135.4982 Y94.3940
G01 X167.3254 Y94.3940
G01 X167.3254 Y5.6437
G01 X143.2014 Y5.6437
G01 X127.8066 Y33.5549
G01 Z5.0000
G00 X237.5961 Y39.3578
G01 Z-2.0000
G02 X237.7495 Y56.6527 I-5.8213 J8.6997
G01 X237.7495 Y56.6527
G01 X249.7070 Y82.8575
G01 X249.7070 Y82.8575
G03 X249.4070 Y10.8575 I-26.3072 J-35.89
G01 X249.4070 Y10.8575
G01 X237.5961 Y39.3578
G01 Z5.0000
G00 X287.9318 Y7.1616
G01 Z-5.0000
G01 X287.9318 Y88.2433
G01 X352.3300 Y88.2433
G01 X352.3300 Y67.8896
G01 X322.1892 Y67.8896
G01 X322.1892 Y57.9546
G01 X343.1069 Y57.9546
G01 X343.1069 Y37.4805
G01 X322.2180 Y37.4805
G01 X322.2180 Y27.5250
G01 X352.2695 Y27.5250
G01 X352.2695 Y7.1616
G01 X287.9318 Y7.1616
G01 Z5.0000
G00 X356.6068 Y7.0729
G01 Z-5.0000
G01 X392.2476 Y67.7852
G01 X359.4945 Y67.7852
G01 X359.4945 Y88.3087
G01 X440.2094 Y88.3087
G01 X404.2957 Y27.4099
G01 X438.9069 Y27.4099
G01 X438.9069 Y7.0729
G01 X356.6068 Y7.0729
G01 Z5.0000
G00 X455.9007 Y8.1994
G01 Z-5.0000
G01 X491.5414 Y68.9118
G01 X458.7884 Y68.9118
G01 X458.7884 Y89.4352
G01 X539.5032 Y89.4352
G01 X503.5896 Y28.5365
G01 X538.2007 Y28.5365
G01 X538.2007 Y8.1994
G01 X455.9007 Y8.1994
G01 Z5.0000

LIST OF G CODES SUPPORTED BYCNC CONTROLS.

Note - Not all G codes apply to each machine.

G Code. Group. Function.

GØØ Positioning (Rapid Traverse)
GØ1 Linear Interpolation (Cutting Feed)
GØ2 Circular Interpolation CW
GØ3 Circular Interpolation CCW
GØ4 Dwell, Exact Stop
G2Ø Imperial Data Input (Inches)
G21 Metric Data Input (Millimeters)
G28 Reference Point Return
G4Ø Cutter Compensation Cancel
G41 Cutter Compensation Left
G42 Cutter Compensation Right
G73 High Speed Peck Drilling Cycle
G74 Counter Tapping Cycle
G76 Fine Boring Cycle
G8Ø Canned Cycle Cancel
G81 Drilling Cycle, Spot Boring
G82 Drilling Cycle, Counter Boring
G83 Deep Hole Peck Drilling Cycle
G84 Tapping Cycle
G85 Boring Cycle
G86 Boring Cycle
G89 Boring Cycle
G9Ø Absolute Zero Command
G91 Incremental Command
G94 Feed per Minute
G95 Feed per Revolution
G98 Return to Initial Level in Canned Cycle
G99 Return to R Point Level in Canned Cycle

Good luck E.A.S

Tanta University

Department: Production Engineering and design
Total Marks: 100 Marks

Faculty of Engineering

Course Title: Factory planning	Course Code:	Year: 4th
Date: Sep 2018	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (answer the following four questions… assume any missing data… answers should be supported by sketches…etc)

Problem number (1) **(10 Marks)**

Distinguish between:

(a) Assembly chart, (b) Operation process chart, (c) string diagram

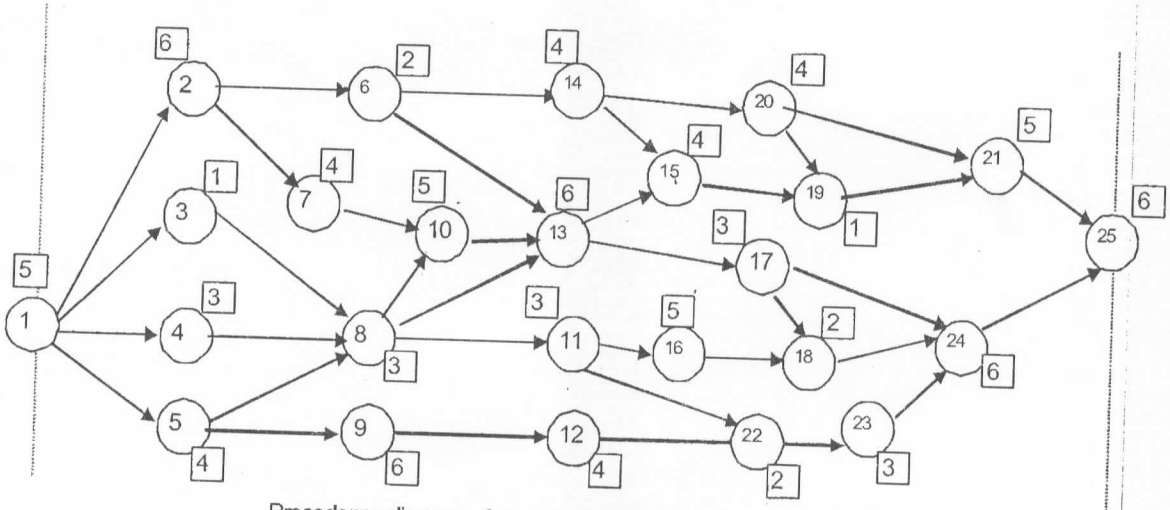
(d) process chart, and (e) Flow process chart

Problem number (2) **(10 Marks)**

Explain the types of layouts with its advantages and disadvantages.

Problem number (3) **(25 Marks)**

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. (Marks)



Precedence diagram of an assemply line

Problem number (4)

Machinery factory produce a special product by using multi machines. The sequence of operations in the production of parts is introduced in Table 1.

Therefore,

a. Use From to Chart to make arrangement of machines inside facility. **(20 Marks)**
b. Make five trials to modify the arrangement and extract MIN total torque. **(35 Marks)**

Continue

Part No.	Rough stores	L1	L2	L3	M11	M2	M3	G1	G2	D1	D2	SH1	SH2	P SH1	P SH2	F IN
1	5	10		20	40		30	60		50		70				80
2	5		20	10	40		30	60		70	50		90		80	100
3	5	20		40	10	30	90	50	80			60		100	70	110
4	5	60	10		20		80	30		70	40	90	50		100	110
5	5	10		40		30				50			20		60	70
6	5			40	30			20		10						50
7	5		50		40			30		60		20		10	70	80
8	5		40		70	30			80	20		10		50		90
9	5		10	50		20		40		30	70			60		80
10	5		20			10			40			50		30		60
11	5			20		30			10	50	70	40			60	80
12 1	5		60		50		40	10			30			80	20	90
13	5		40		80	20	10		70		50		90	60	30	100
14	5	90	30		100	80	20	10		70	40	110	6		50	120
15	5	10		50		30	60			70		20		80	40	90
16	5		10		20			30			40					50

With best wishes

A.M.Elkassas