جمهورية العراق

وزارة التعليم العالي و البحث العلمي

جامعة الفرات الأوسط التقنية

الكلية التقنية الهندسية / النجف

قسم هندسة تقنيات الطيران

المرحلة الثانية

أسئلة الامتحان النهائي للعام الدراسي

٢٠١٥-٢٠١٦

الدور الأول

شعبة ضمان الجودة و الأداء الجامعي

قسم الطيران
ط/ب

MEM 2021

المرحلة الثانية المادة نظرية طيران الزمن ثلاث ساعات المصحح / [illegible]		وزارة التعليم العالي و البحث العلمي جامعة الفرات الاوسط التقنية الكلية التقنية المسيب قسم هندسة الطيران

Attempt all questions.

All questions have equal marks

Q1: Why would the dimensional analysis is important for calculating aerodynamic coefficients?

Q2: What is the difference between the real area of wings and the area used in aerodynamic calculation?

Q3: Explain the behavior of lift coefficient with the change of angle of attack.

Q4: A small plane of 500kg mass moves horizontally of 1000m height. The acceleration of the plane is 10 m/s^2, if the drag of the plane is 10000N. what is the thrust force of the engine?

Q5: An airplane is steadily gliding to land with an angle of 10°. If the lift force is 500 000 N, what is the drag force of that plane?

Q6: A plane steadily climbing with an angle of 15°. The mass of the plane is 600 kg. while the drag force is 2000N. What is the drag force of the plane?

Q7: An airfoil with 180 cm chord, 0.2 lift coefficient, and 21.6 cm of maximum thickness. The location of the minimum pressure is 40% of chord. Write the NACA code of this airfoil based on 6 digits' airfoils.

Q8: Describe with sketches the work of winglets and the effect of downwash.

Q9: What is the principle work of delta wings, and their use?

Q10: What is the supercritical airfoil, how it works? Sketch it.

Good Luck

N4 042

قسم الطيران
ح/ب

Ministry of Higher Education and Scientific Research
Foundation of Technical Education
Al-Furat Al-Awsat Technical University
Technical Engineering College / Najaf

Department: Aeronautical Technical Engineering
Stage: Second
Subject: Fluid Mechanics
Exam Time: Three Hours

The Final Exam Questions for the Academic Year 2015-2016
First Semester

Note: Answer Five Questions only, All Questions Have Same Marks

Q1/A- Define incompressible flow and incompressible fluid.Must the flow of a compressible fluid necessarily be treated as compressible?

Q1/B- Two pipes are connected by a manometer as shown in Fig. 1, (Take the density of water $= 1000\ kg/m^2$). Determine the pressure difference, between the pipes (P_A-P_B).

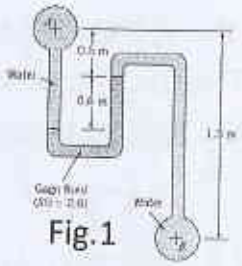


Fig.1

Q2/ The water side of the wall of a 100-m-long dam is a quarter circle with a radius of 10 m as shown in Fig.2. (Take the density of water $\rho = 1000\ kg/m^2$), Determine:

(a) The horizontal force on vertical surface (F_H).
(b) The vertical force on horizontal surface (F_V).
(c) The resulting hydrostatic force on the dam (F_R).
(d) The line of action when the dam is filled to the rim (θ) .

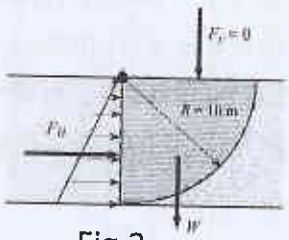


Fig.2

Q3/A- A steady, incompressible, two-dimensional velocity field is given by

$$\vec{V} = (u, v) = (1 + 2.5x + y)\vec{i} + (-0.5 - 1.5x - 2.5y)\vec{j}$$

where the x- and y-coordinates are in m and the magnitude of velocity is in m/s. Calculate the material acceleration at the point (x =2 m, y =3 m).

Q3/B- Water flows at a rate of 0.035 m^3 /s in a horizontal pipe whose diameter is reduced from 15 cm to 8 cm by a reducer Fig. 3. If the pressure at the centerline is measured to be 470 kPa and 440 kPa before and after the reducer, respectively,Take the kinetic energy correction factors to be $\alpha = 1.05$, and the density of water $\rho = 1000\ kg/m^2$. Determine:

(a) The inlet velocity (V_1)
(b) The outlet velocity (V_2)
(c) The irreversible head loss in the reducer by using energy equation (h_L).

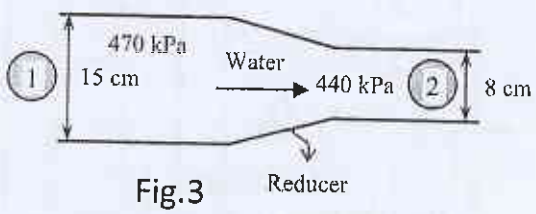


Fig.3

Q4/ A 100-ft ^{3} /s water jet is moving in the positive x-direction at 20 ft/s. The stream hits a stationary splitter, such that half of the flow is diverted upward at 45° and the other half is directed downward, and both streams have a final speed of 20 ft/s as shown in Fig. 4. Disregarding gravitational effects,.(Take the momentum-flux correction factor $\beta = 1$ and density of water $\rho = 62.4\ Ibm/ft^3$) determine:

(a) The mass flow rate of water jet $(\dot{m})$.
(b) The x- components of the force required to hold the splitter in place against the water force (F_{Rx}).
(c) The z- components of the force required to hold the splitter in place against the water force (F_{Rz}).

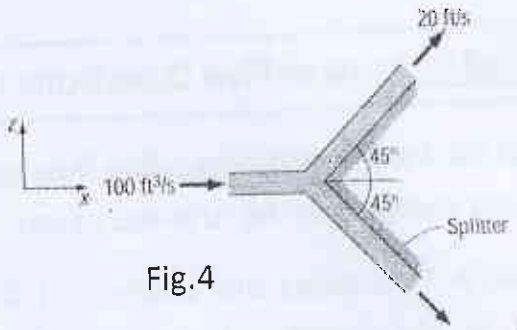


Fig.4

Q5/ A boundary layer is a thin region (usually along a wall) in which viscous forces are significant and within which the flow is rotational. Consider a boundary layer growing along a thin flat plate. The flow is steady. The boundary layer thickness δ at any downstream distance x is a function of x, free-stream velocity V , and fluid properties ρ (density) and μ (viscosity). Use the method of repeating variables to generate a dimensionless relationship for $\delta = f(x, V, \rho, \mu)$ as a function of the other parameters. Show all your work.

Q6/ Air enters a 7-m-long section of a rectangular duct of cross section 15 cm . 20 cm made of commercial steel at 1 atm and 35°C (take the density of air $\rho = 894\ kg/m^3$, and the dynamic viscosity of air $\mu = 1.895 \times 10^{-5} kg/(m.s)$) at an average velocity of 7 m/s (Fig. 6) . Disregarding the entrance effects, determine:

(a) The hydraulic diameter of duct.
(b) The Reynolds number and show is the flow laminar or turbulent.
(c) The friction factor.
(d) The pressure losses by the flow of oil in the duct.

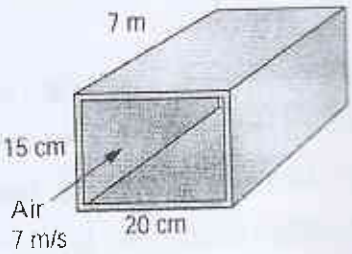


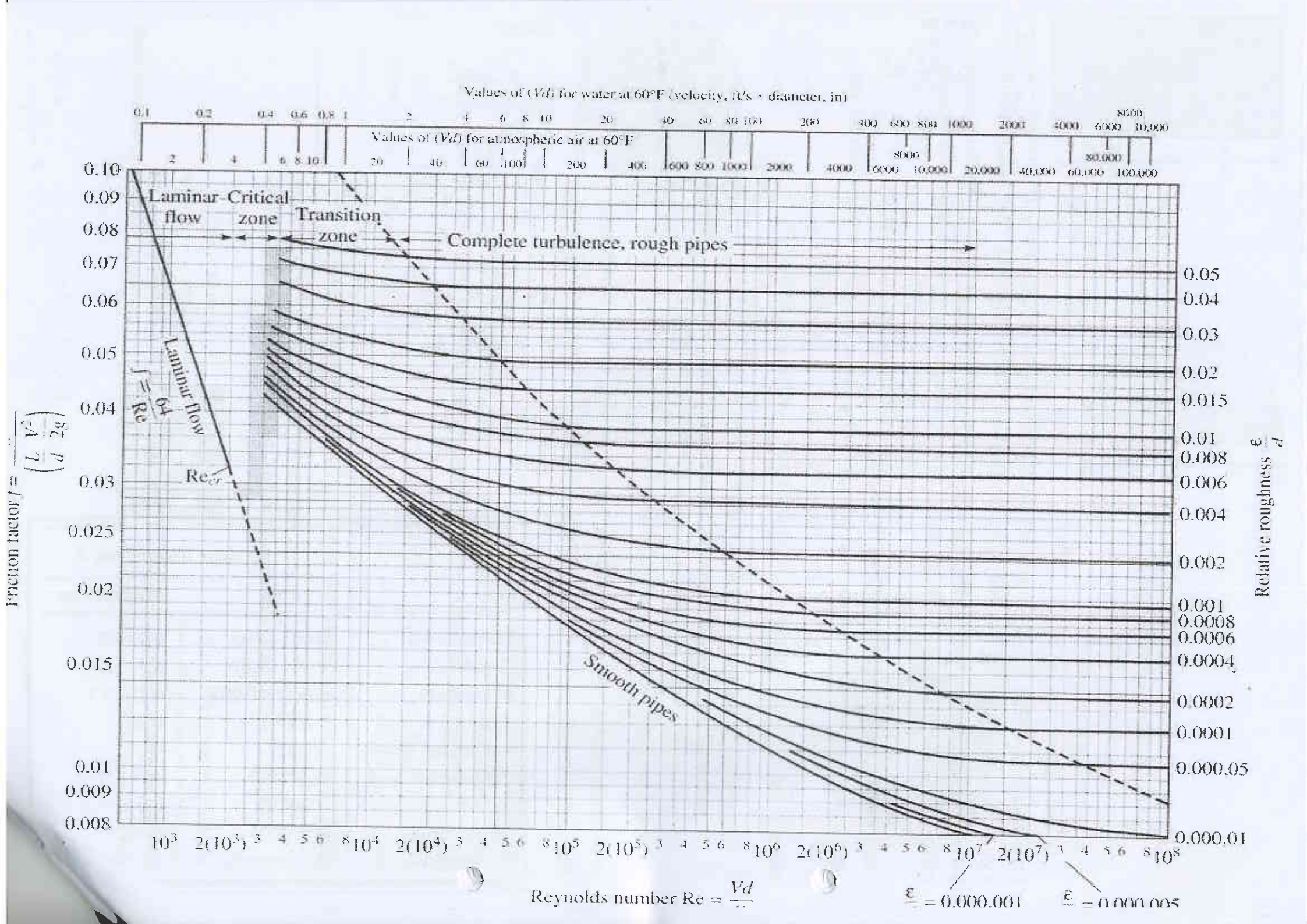
Fig.6

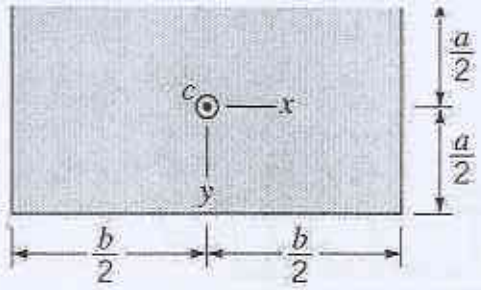
Good Luck

Dhafeer

Lecturer
Dr. Dhafeer M. AL-Shamkhi

Head of Department
Dr. Ali Shakir Baqir


Values of (Vd) for water at 60°F (velocity, ft/s × diameter, in)
Values of (Vd) for atmospheric air at 60°F
Laminar flow
Critical zone
Transition zone
Complete turbulence, rough pipes
Laminar flow
f = 64/Re
Re_cr
Smooth pipes
Friction factor f = h_f / (L/d · V²/2g)
Relative roughness ε/d
Reynolds number Re = Vd/ν
ε = 0.000.001
ε = 0.000.005



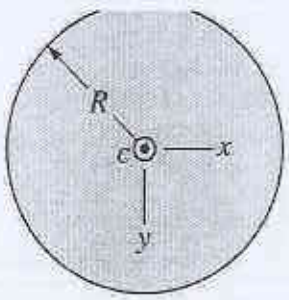
(a)

$A = ba$

$I_{xc} = \frac{1}{12}ba^3$

$I_{yc} = \frac{1}{12}ab^3$

$I_{xyc} = 0$

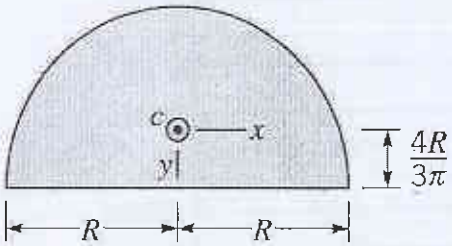


(b)

$A = \pi R^2$

$I_{xc} = I_{yc} = \frac{\pi R^4}{4}$

$I_{xyc} = 0$



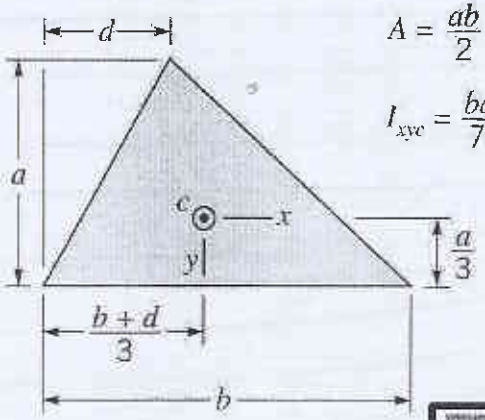
(c)

$A = \frac{\pi R^2}{2}$

$I_{xc} = 0.1098R^4$

$I_{yc} = 0.3927R^4$

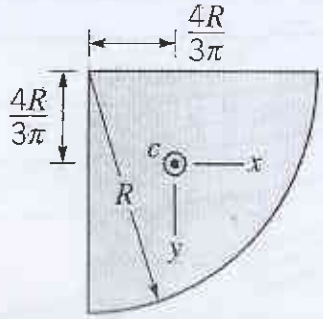
$I_{xyc} = 0$



(d)

$A = \frac{ab}{2}$ $\quad I_{xc} = \frac{ba^3}{36}$

$I_{xyc} = \frac{ba^2}{72}(b - 2d)$



(e)

$A = \frac{\pi R^2}{4}$

$I_{xc} = I_{yc} = 0.05488R^4$

$I_{xyc} = -0.01647R^4$

Pipe	Equivalent Roughness, ε	
	Feet	Millimeters
Riveted steel	0.003–0.03	0.9–9.0
Concrete	0.001–0.01	0.3–3.0
Wood stave	0.0006–0.003	0.18–0.9
Cast iron	0.00085	0.26
Galvanized iron	0.0005	0.15
Commercial steel	0.00015	0.045
or wrought iron	0.00015	0.045
Drawn tubing	0.000005	0.0015
Plastic, glass	0.0 (smooth)	0.0 (s

قسم الطيران
ت/ط

نظم MM601

Al-Furat Al-Awsat Technical University
Aeronautical Technical Engineering Department
Subject/ Programming
Class/ Second
Time/ 2 hours

Final Exam 2015-2016

Note: - Answer five question

Q1/ complete the following **(Five only):-**

1- When we to plot Tours in AutoCAD two basic number must be specify one for _____ and second for _____.
2- Sweep in AutoCAD used for _____.
3- _____ used in AutoCAD to rotated an object in 3D space.
4- _____, _____, _____ tools are used to modify object and convert it from 2D to 3D space.
5- _____ Used in AutoCAD to make two or more objects as one object.
6- The _____ command in AutoCAD program can be used to quickly create a line between two nonparallel lines. **(20 mark)**

Q2/ write a program in GUI to enter two number and find the sum of them, then show if the result is even or odd. **(20 mark)**

Q3/ what is the difference between the following with example:-

1- **For…end** loop and **while…end** loop
2- **Subtract** and Intersect **(20 mark)**

Q4/ write a program in GUI to show the work of traffic as shown:-

Red ⟶ stop
Green ⟶ go
Yellow ⟶ wait **(20 mark)**

Q5/ what is the types of arithmetic operations in MATLAB? Explain them with example? **(20 mark)**

Q6/ plot the functions

1- Y= sin^2x with color is red
2- z= cos^2x with color is blue
3- w= $sin^2x \,.\, cos^2x$ with color is yellow
4- v= $\frac{sin^2x}{cos^2x}$ with color is green

In the interval $-2\pi \le x \le 2\pi$ and step is $(\pi/5)$
use the plot command to display these function on same windows on the same graph .and adding a plot title, axis labels to the figure with Adding a Legend to a Graph . **(20 mark)**

Good Luck

Lecture
Rusul Sabah

Head of Dept
Dr. Ali Shakir

قسم الطيران

ط/ح

ATU University
Technical College Engineering - Annajaf

Dep. : Automotive & Aeronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 3 hours.

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Note: Endeavor All Questions

Group (A): Mechanics of Materials Conceptions (40 Marks)

Q1: What is the effect of the following states? (20 Marks)

(1) $\sigma_{Allow} = \sigma_{Fail}$.

(2) Body stressed under proportion limit.

(3) K and n constants in deflected body.

(4) Error in reading of strain gauge.

(5) Lateral to longitudinal strains.

Q2: Prove the following equations: (20 Marks)

(1) $\epsilon_t = \ln\frac{1}{1-r}$ (2) $\epsilon_t = \ln\left(\frac{\sigma_t}{\sigma_e}\right)$

Group (B): Mechanics of Materials Problems (60 Marks)

Q1: The rigid beam shown in figure (1) is fixed to the top of the three posts made of A-36 steel and 2014-T6 aluminum. The posts each have a length of 250 mm when no load is applied to the beam, and the temperature is ($T_1 = 20$ °C). Determine the force supported by each post if the bar is subjected to a uniform distributed load of (150 kN/m) and the temperature is raised to ($T_2 = 80$ °C). (20 Marks)

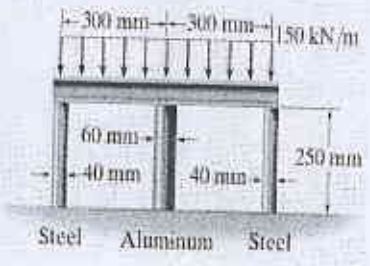

Figure (1) Posts support

Q2: Draw S.F.D and B.M.D that is indicating in figure (2): (20 Marks)

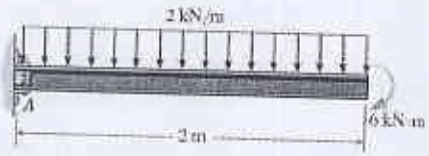

Figure (2) Cantilever beam

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Q3: Select the one of the following questions: (20 Marks)

(A) The control arm is subjected to the loading shown in figure (3). Determine to the nearest $(3/4)$ inch the required diameter of the steel pin at C if the allowable shear stress for the steel is τ_{allow}= (8) ksi.

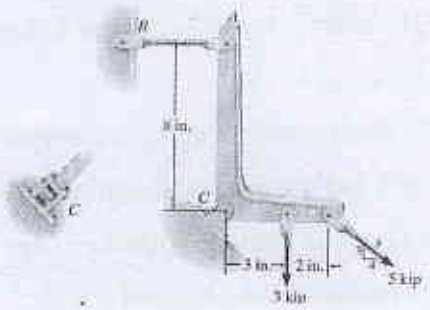


Figure (3) Control arm fixed by two pins

(B) When force P is applied to the rigid lever arm (ABC) in figure (4), the arm rotates counterclockwise about pin A through an angle of (0.05°). Determine the normal strain developed in wire (BD).

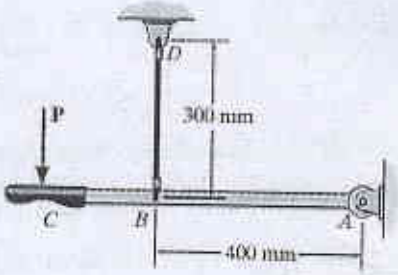


Figure (4) Arm rotates about pin

GOOD LUCK

Examiner	Head of Aeronautical Dep.	Head of Automobile Dep.
A.Lecturer: Mohammed A. Abass	A. Prof. Dr. Ali S. Baqir	Dr. Haider H. Al-Abdili

Average Mechanical Properties of Typical Engineering Materials[a]
(SI Units)

Materials	Density ρ (Mg/m³)	Modulus of Elasticity E (GPa)	Modulus of Rigidity G (GPa)	Yield Strength (MPa) σ_Y Tens.	Yield Strength (MPa) σ_Y Comp.[b]	Yield Strength (MPa) σ_Y Shear	Ultimate Strength (MPa) σ_u Tens.	Ultimate Strength (MPa) σ_u Comp.[b]	Ultimate Strength (MPa) σ_u Shear	% Elongation in 50 mm specimen	Poisson's Ratio ν	Coef. of Therm. Expansion α $(10^{-6})/°C$
Metallic												
Aluminum Wrought Alloys — 2014-T6	2.79	73.1	27	414	414	172	469	469	290	10	0.35	23
Aluminum Wrought Alloys — 6061-T6	2.71	68.9	26	255	255	131	290	290	186	12	0.35	24
Cast Iron Alloys — Gray ASTM 20	7.19	67.0	27	–	–	–	179	669	–	0.6	0.28	12
Cast Iron Alloys — Malleable ASTM A-197	7.28	172	68	–	–	–	276	572	–	5	0.28	12
Copper Alloys — Red Brass C83400	8.74	101	37	70.0	70.0	–	241	241	–	35	0.35	18
Copper Alloys — Bronze C86100	8.83	103	38	345	345	–	655	655	–	20	0.34	17
Magnesium Alloy [Am 1004-T61]	1.83	44.7	18	152	152	–	276	276	152	1	0.30	26
Steel Alloys — Structural A36	7.85	200	75	250	250	–	400	400	–	30	0.32	12
Steel Alloys — Stainless 304	7.86	193	75	207	207	–	517	517	–	40	0.27	17
Steel Alloys — Tool L2	8.16	200	75	703	703	–	800	800	–	22	0.32	12
Titanium Alloy [Ti-6Al-4V]	4.43	120	44	924	924	–	1,000	1,000	–	16	0.36	9.4
Nonmetallic												
Concrete — Low Strength	2.38	22.1	–	–	–	12	–	–	–	–	0.15	11
Concrete — High Strength	2.38	29.0	–	–	–	38	–	–	–	–	0.15	11
Plastic Reinforced — Kevlar 49	1.45	131	–	–	–	–	717	483	20.3	2.8	0.34	–
Plastic Reinforced — 30% Glass	1.45	72.4	–	–	–	–	90	131	–	–	0.34	–
Wood Select Structural Grade — Douglas Fir	0.47	13.1	–	–	–	–	2.1[c]	26[d]	6.2[d]	–	0.29[e]	–
Wood Select Structural Grade — White Spruce	3.60	9.65	–	–	–	–	2.5[c]	36[d]	6.7[d]	–	0.31[e]	–

[a] Specific values may vary for a particular material due to alloy or mineral composition, mechanical working of the specimen, or heat treatment. For a more exact value reference books for the material should be consulted.

[b] The yield and ultimate strengths for ductile materials can be assumed equal for both tension and compression.

[c] Measured perpendicular to the grain.

[d] Measured parallel to the grain.

[e] Deformation measured perpendicular to the grain when the load is applied along the grain.

قسم الطيران
٢/ب

Technical College of Najaf *Subject:Manufacturing processes*

Aero. *Department* *Class: 2nd Stage*

Examiner: Oraskhudayer *First Attempt (2015-2016)* *Time :hrs*

.....

Q1/A master aluminum pattern is to be cast using a wooden pattern for hollow steel cylindrical piece with a flange of width 50 mm and diameter 245mm. The cylindrical portion is 195 mm long with an outer diameter 147mm and an inner diameter 70 mm . If the face of the flange is to be machined , design the wooden pattern ? (20 D)

.....

Q2/ Enumerate the principle properties which are to be desired in a bearing alloy . Illustrate how these properties are obtained by reference to typical metallic bearing materials?(20 D)

.....

Q3/(A) Why is the current used on resistance spot welding larger than for resistance seam welding? What are the advantages of projection welding ? (10 D)

(B) Distinguish between seam welding and spot welding. Explain, whether dissimilar metals can be welded by resistance welding. If so, give the necessary precautions.

(10 D)

.....

Q4/ Choose Two branches only

(A)Discuss the effect of chemical composition and cooling rate on the structure and properties of cast irons . Briefly describe one method for producing (1) malleable iron . (2) nodular iron ? (10 D)

(B) Compare the Cu-Zn and Cu-Ni ranges of alloys from the following aspects where applicable : (1) suitability for hot and cold working , (2) effect the additional alloying elements, (3) susceptibility to , and effect of , heat treatment ,(4) typical compositions and uses ? (10 D)

(C) Which types of alloy can be hardened (1) by cold working , (2) by precipitation hardening , (3) by combination of (1) and (2) ? Why it is necessary to exercise close control of heat treatment variables in precipitation hardening heat treatment? (10 D)

EMN 00263 قسم الطيران ٢/b

وزارة التعليم العالي والبحث العلمي
جامعة الفرات الاوسط التقنية
الكلية التقنية الهندسية- نجف

القسم : قسم هندسة تقنيات الطيران
المرحلة :الثانية
المادة: Thermodynamic
وقت الامتحان: ساعتان
التأريخ: 2016/06/ 05

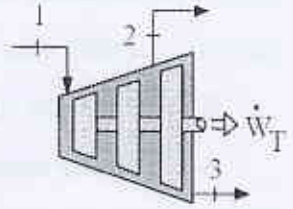
الامتحان النهائي الدور الاول للعام 2015-2016

Note: 1) Allow using tables

Q1/CHOOSE (A) or (B) (15M)

(A) Water in a 150-L closed, rigid tank is at 100°C, 90% quality. The tank is then cooled to -10°C. Calculate the heat transfer during the process.

(B) A steam turbine receives water at 15 MPa, 600°C at a rate of 100 kg/s. In the middle section 20 kg/s is withdrawn at 2 MPa, 350°C, and the rest exits the turbine at 75 kPa, and 95% quality. Assuming no heat transfer and no changes in kinetic energy, find the total turbine power output.



Q2/ (A) The thermal efficiency of the Rankine cycle is improved by many methods, what are these methods? **(5M)**

(B) What advantages of ***regenerative*** cycle over ***simple Rankine cycle***? **(5M)**

Q3/ (A) Consider a simple ideal Rankine cycle with fixed turbine inlet conditions. What is the effect of ***lowering the condenser pressure*** on: **(5M)**

1) Pump work input: (*a*) increases, (*b*) decreases, (*c*) remains the same
2) Turbine work output: (*a*) increases, (*b*) decreases, (*c*) remains the same
3) Heat supplied: (*a*) increases, (*b*) decreases, (*c*) remains the same
4) Heat rejected: (*a*) increases, (*b*) decreases, (*c*) remains the same
5) Cycle efficiency: (*a*) increases, (*b*) decreases, (*c*) remains the same

(B) A simple ideal Brayton cycle is modified to incorporate multistage compression with intercooling, multistage expansion with reheating, and regeneration without changing the pressure limits of the cycle. As a result of these modifications: **(5M)**

1) Compressor work (*a*) increases, (*b*) decreases, (*c*) remains the same
2) Back work ratio (*a*) increases, (*b*) decreases, (*c*) remains the same
3) Thermal efficiency (*a*) increases, (*b*) decreases, (*c*) remains the same
4) Heat rejected (*a*) increases, (*b*) decreases, (*c*) remains the same

Q4/ A power plant with one closed feedwater heater has a condenser temperatureof45°C, a maximum pressure of 5 MPa, and boiler exit temperature of 900°C. Extraction steam at 1 MPa

to the feedwater heater condenses and is pumped up to the 5 MPa feedwater line, where all the water goes to the boiler at 200°C. Find the fraction of extraction steam flow and the two specific pump work inputs. **(15M)**

Q5/ CHOOSE (A) or (B) (15M)

(A) A tank contains 21 kg of dry air and 0.3 kg of water vapor at 30°C and 100 kPa total pressure. Determine (*a*) the specific humidity, (*b*) the relative humidity, and (*c*) the volume of the tank, (d) the dew-point temperature.

(B) **1-** In summer, the outer surface of a glass filled with iced water frequently "sweats." How can you explain this sweating? **(3M)**

2- What is the difference between the specific humidity and the relative humidity? **(4M)**

3- What the reasons in practice difficult to operate Carnot cycle? **(8M)**

Q6/ A 2-m^3 rigid tank initially contains air at 100 kPa and 22°C. The tank is connected to a supply line through a valve. Air is flowing in the supply line at 600 kPa and 22°C. The valve is opened, and air is allowed to enter the tank until the pressure in the tank reaches the line pressure, at which point the valve is closed. A thermometer placed in the tank indicates that the air temperature at the final state is 77°C. Determine (*a*) the mass of air that has entered the tank and (*b*) the amount of heat transfer. **(15M)**

Q7/ In a gas turbine plant working on Brayton cycle, the air at inlet is 27°C, 0.1 MPa. The pressure ratio is 6.25 and the maximum temperature is 800°C. The turbine and compressor efficiencies are each 80%. Find: (a) Compressor work, (b) Turbine work, (c) Heat supplied, (d) Cycle efficiency and (e) Turbine exhaust temperature. Mass of air may be considered as 1 kg. Draw T-s diagram. **(20M)**

Examiner

Basil Noori Merza

Head of department

Dr. Ali Shaker

EMN 00263

قسم الطيران
٢/ط

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
هيئة التعليم التقني
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية / نجف

القسم : هندسة تقنيات الطيران
المرحلة : الثانية
المادة: رياضيات/٢
زمن الامتحان:٣ ساعات
التاريخ: / 2016

الامتحان النهائي- العام الدراسي ٢٠١٥/٢٠١٦

Q1// Solve the following equations: **(choose only four).** (40)

1) $\frac{dy}{dx} = \frac{2x\ln x + x}{\sin y + y\cos y}$

2) $\left(1 + e^{x/y}\right)dx + \left(1 - \frac{x}{y}\right)e^{x/y}dy = 0$

3) $\frac{d^2y}{dx^2} - \frac{dy}{dx} = e^x \cos x$

4) $\frac{dy}{dx} = x^3y^2 + xy$

5) $(x^4e^x - 2mxy^2)dx + 2mx^2ydy = 0$

Q2// a) If $v = (x^2 + y^2 + z^2)^{-\frac{1}{2}}$, show that $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2} = 0$ (20)

b) Find the extreme value of $f(x, y) = xy - x^2 - y^2 - 2x - 2y + 4$.

Q3// **Graph** the following ; (20)

a) r=a(1+2sin θ)

b) $r^2 = 4a^2\cos\theta$

Q4//Evaluate the following integral:**(choose only two).** (20)

a) $\int_0^1 \int_y^1 x^2 e^{xy}\, dxdy.$

b) $\int_0^4 \int_{\frac{y}{2}}^{\sqrt{y}} (4x + 2)dxdy$

c) $\int_{-1}^{1} \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} dydx$

Good Luck

رئيس القسم
د.علي شاكر

مدرس المادة
رسل عاشور جواد

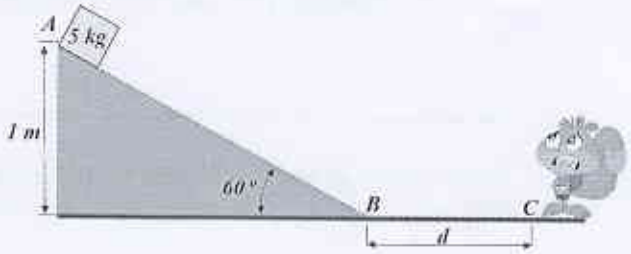
قسم الطيران
ط/ ٢

Ministry of **Higher Education** & Scientific Research
Al-Furat Al-**Awsat Technical University**
Engineering **Technical College**- Najaf
Department **of Aeronautical Eng.** Tech.

Class Level: **2nd level** Course Title: Dynamics
Instructor: **Dr. Assaad** Al-Sahlani Final Exam (B) / 2015-2016 Time: 3 hours

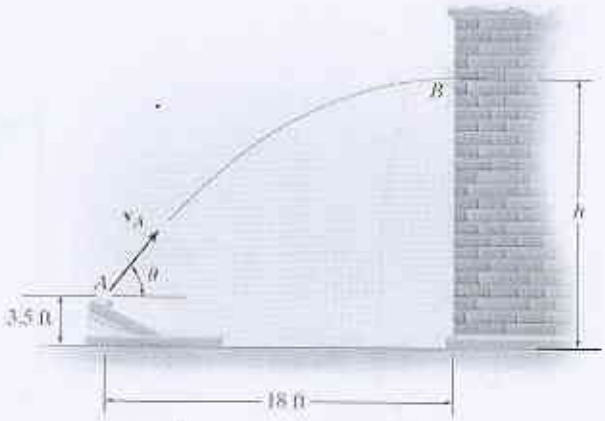
Q1: A **5 kg box** starts from rest and slides on a **smooth** surface **AB** .

1. **What** is the velocity of the box at point B? (**7 points**)
2. **If the** coefficient of kinetic friction on the horizontal surface BC is 0.2, what would be the safest distance ***d*** to **avoid** hitting the squirrel. (Use the energy method and **be careful** about the little animal!). (**8 points**)



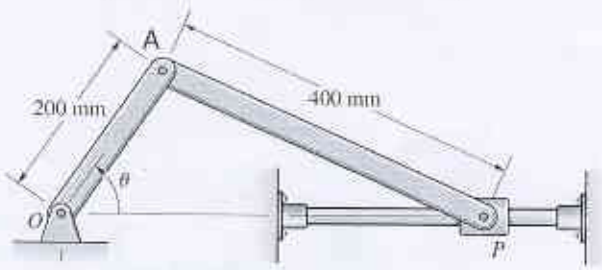
Q2: **The catapult** is used to launch a ball such that it strikes **the wall of the** building at the maximum height of its trajectory. **If it takes** 1.5 s to travel from A to B, determine:

1. **The velocity** V_A at which it was launched. (**5 points**)
2. **The angle** of release θ. (**5 points**)
3. **The height** h. (**5 points**)



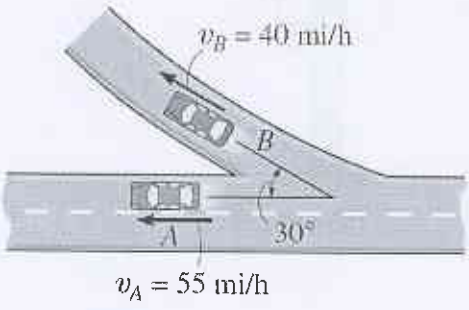
Q3: **For the** mechanism shown, $\theta = (\pi/180)^o$ and $\dot{\theta}$=1 rad/s **counterclockwise**. Find:

1. **The velocity** of point A. (**5 points**)
2. **The velocity** of point P. (**5 points**)
3. **The angular** velocity of link AP. (**5 points**)



Q4: **At the instant** shown, cars **A** and **B** are traveling at speeds of 55 mi/h and 40 mi/h, respectively. If car ***B*** **is increasing** its speed by 1200 mi/h^2 while car ***A*** maintains a constant speed, knowing that car **B** moves along a curve having a radius of curvature of 0.5 mi. Determine:

1. The velocity of **B** with respect to **A**. (**5 points**)
2. The total acceleration of car **B**.(**5 points**)
3. The acceleration of **B** with respect to **A**. (**5 points**)



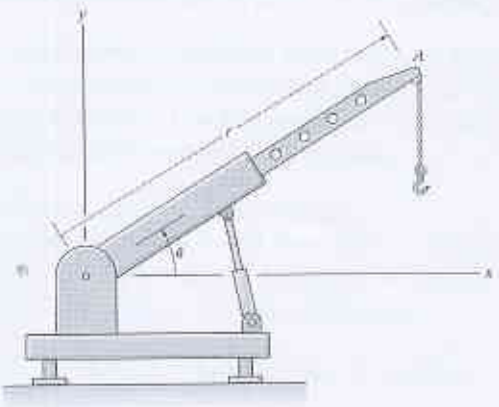
Next page please...

Answer two of the followings

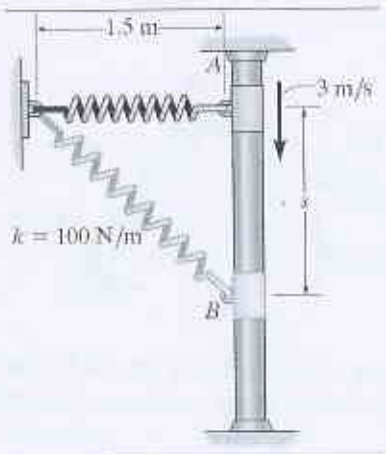
Q5: The velocity of a particle traveling along a straight line is $v = 3t^2 - 6t$ ft/s, where t is in seconds. If $s = 4$ ft when $t = 0$.

1. Determine the position of the particle when $t = 4$ s. **(8 points)**
2. What is the total distance traveled during the time interval $t = 0$ to $t = 4$ s ? **(7 points)**
3. What is the acceleration when $t = 2$ s ? **(5 points)**

Q6: The polar coordinates of point **A** of the crane are given as functions of time in seconds by $r = 3 + 0.2t^2$ m and $\theta = 0.02t^2$ rad. Determine the acceleration of point **A** in terms of polar coordinates at $t = 3$ s. **(20 points)**



Q7: The 4-kg smooth collar has a speed of 3 m/s when it is at $s = 0$ (vertically). Determine the maximum distance s it travels before it stops momentarily. The spring has an unstretched length of 1 m. **(20 points)**



Good Luck!

Cordially !

Head of Dept.
Assist. Prof. Dr. Ali Al Jaberi

Instructor
Dr. Assaad Al Sahlani

قسم الطيران
ط/

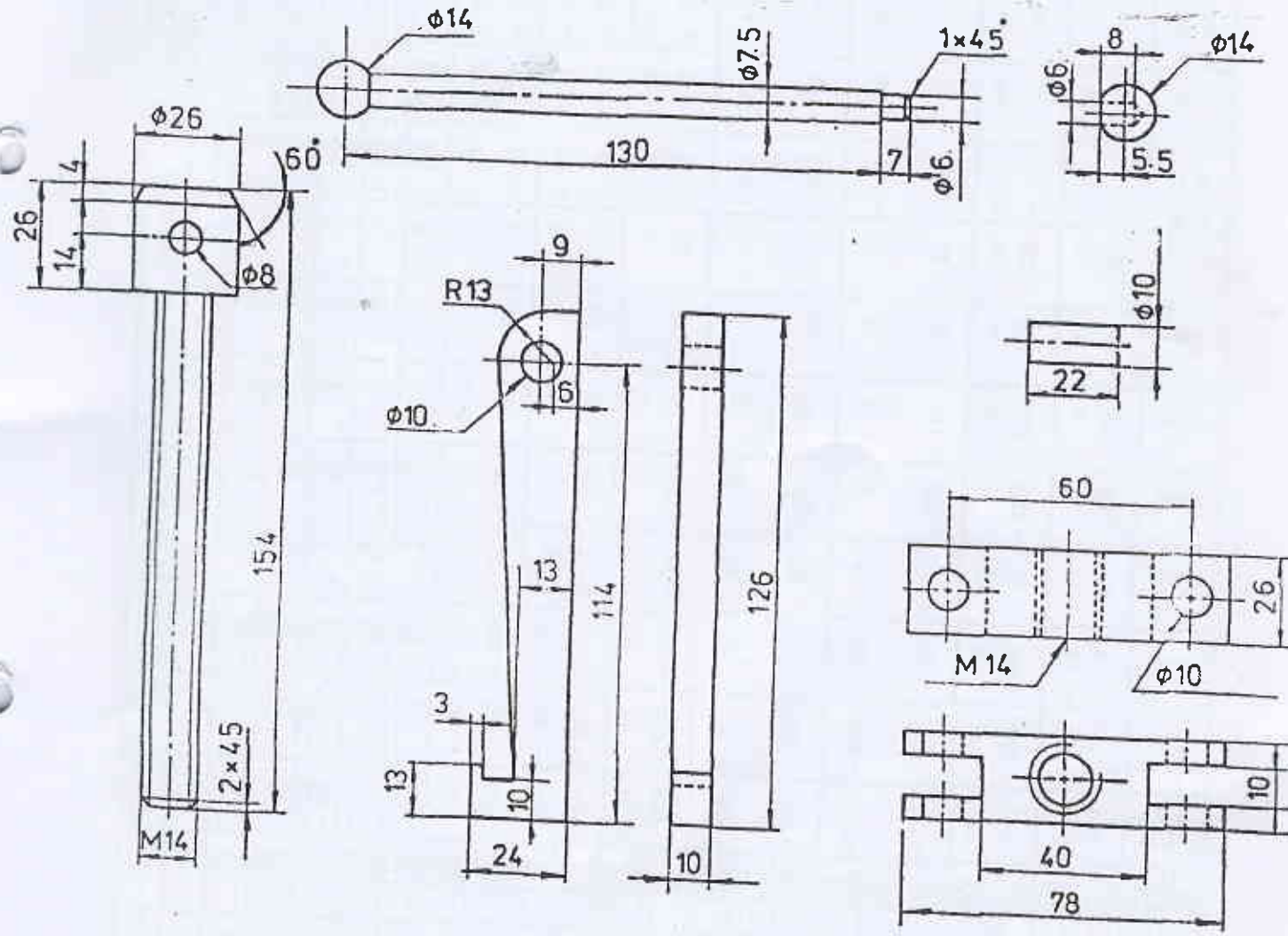
وزارة التعليم العالي والبحث العلمي
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية /نجف

قسم هندسة تقنيات الطيران
الرسم الميكانيكي/ المرحلة الثانية
وقت الامتحان/ ثلاث ساعات

Q1/ From the figures below, Draw **Front, Top** and **Side** for the assembly. (76 marks)

Q2/ Calculate and sketch the following tolerances. (24 marks)

A) **18 F8r6** B) **30 K7h7** C) **65P7h9**



Lecturer
Dr. Ahmed H. Ali

Head of Dep.
Assist. Prof. Dr. Ali Sh. Baqir

FOR DIAMETER STEPS IN MILIMETER	ISO-TOLERANCE ZONE FOR SHAFT — VALUES OF DEVIATION IN MICRONS (1μ = 0.001 mm)																
	a_{11}	b_{11}	c_{11}	d_9	e_8	f_7	g_6	h_{11}	h_9	h_7	h_6	js_6	k_6	n_6	p_6	r_6	s_6
— 3	− 270 − 330	− 140 − 200	− 60 − 120	− 20 − 45	− 14 − 28	− 6 − 16	− 2 − 8	0 − 60	0 − 25	0 − 10	0 − 6	+ 3 − 3	+ 6 0	+ 10 + 4	+ 12 + 6	+ 16 + 10	+ 20 + 14
> 3 — 6	− 270 − 345	− 140 − 215	− 70 − 145	− 30 − 60	− 20 − 38	− 10 − 22	− 4 − 12	0 − 75	0 − 30	0 − 12	0 − 8	+ 4 − 4	+ 9 + 1	+ 16 + 8	+ 20 + 12	+ 23 + 15	+ 27 + 19
> 6 — 10	− 280 − 370	− 150 − 240	− 80 − 170	− 40 − 76	− 25 − 47	− 13 − 28	− 5 − 14	0 − 90	0 − 36	0 − 15	0 − 9	+ 4.5 − 4.5	+ 10 + 1	+ 19 + 10	+ 24 + 15	+ 28 + 19	+ 32 + 23
> 10 — 18	− 290 − 400	− 150 − 260	− 95 − 205	− 50 − 93	− 32 − 59	− 16 − 34	− 6 − 17	0 − 110	0 − 43	0 − 18	0 − 11	+ 5.5 − 5.5	+ 12 + 1	+ 23 + 12	+ 29 + 18	+ 34 + 23	+ 39 + 28
> 18 — 30	− 300 − 430	− 160 − 290	− 110 − 240	− 65 − 117	− 40 − 73	− 20 − 41	− 7 − 20	0 − 130	0 − 52	0 − 21	0 − 13	+ 6.5 − 6.5	+ 15 + 2	+ 28 + 15	+ 35 + 22	+ 41 + 28	+ 48 + 35
> 30 — 40	− 310 − 470	− 170 − 330	− 120 − 280	− 80	− 50	− 23	− 9	0	0	0	0	+ 8	+ 18	+ 33	+ 42	+ 50	+ 59
> 40 — 50	− 320 − 480	− 180 − 340	− 130 − 290	− 142	− 89	− 50	− 25	− 160	− 62	− 25	− 16	− 8	+ 2	+ 17	+ 26	+ 34	+ 42
> 50 — 65	− 340 − 530	− 190 − 380	− 140 − 330	− 100	− 60	− 30	− 10	0	0	0	0	+ 9.5	+ 21	+ 39	+ 51	+ 60 + 41	+ 72 + 53
> 65 — 80	− 360 − 550	− 200 − 390	− 150 − 340	− 174	− 106	− 60	− 29	− 190	− 74	− 30	− 19	− 9.5	+ 2	+ 20	+ 32	+ 62 + 43	+ 78 + 59
> 80 — 100	− 380 − 600	− 220 − 440	− 170 − 390	− 120	− 72	− 36	− 12	0	0	0	0	+ 11	+ 25	+ 45	+ 59	+ 73 + 51	+ 93 + 71
> 100 — 120	− 410 − 630	− 240 − 460	− 180 − 400	− 207	− 126	− 71	− 34	− 220	− 87	− 35	− 22	− 11	+ 3	+ 23	+ 37	+ 76 + 54	+ 101 + 79
> 120 — 140	− 460 − 710	− 260 − 510	− 200 − 450	− 145	− 85	− 43	− 14	0	0	0	0	+12.5	+ 28	+ 52	+ 68	+ 88 + 63	+ 117 + 92
> 140 — 160	− 520 − 770	− 280 − 530	− 210 − 460													+ 90 + 65	+ 225 + 100
> 160 — 180	− 580 − 830	− 310 − 560	− 230 − 480	− 245	− 148	− 83	− 39	− 250	− 100	− 40	− 25	−12.5	+ 3	+ 27	+ 43	+ 93 + 68	+ 133 + 108
> 180 — 200	− 660 − 950	− 340 − 630	− 240 − 530	− 170	− 100	− 50	− 15	0	0	0	0	+14.5	+ 33	+ 60	+ 79	+ 106 + 77	+ 151 + 122
> 200 — 225	− 740 − 1030	− 380 − 670	− 260 − 550													+ 109 + 80	+ 159 + 130
> 225 — 250	− 820 − 1110	− 420 − 710	− 280 − 570	− 285	− 172	− 96	− 44	− 290	− 115	− 46	− 29	−14.5	+ 4	+ 31	+ 50	+ 113 + 84	+ 169 + 140
> 250 — 280	− 920 − 1240	− 480 − 800	− 300 − 620	− 190	− 110	− 56	− 17	0	0	0	0	+ 16	+ 36	+ 66	+ 88	+ 126 + 94	+ 190 + 158
> 280 — 315	− 1050 − 1470	− 520 − 860	− 330 − 650	− 320	− 191	− 108	− 49	− 320	− 130	− 52	− 32	− 16	+ 4	+ 34	+ 56	+ 130 + 98	+ 202 + 170
> 315 — 355	− 1200 − 1560	− 600 − 960	− 360 − 720	− 210	− 125	− 62	− 18	0	0	0	0	+ 18	+ 40	+ 73	+ 98	+ 144 + 108	+ 226 + 190
> 355 — 400	− 1350 − 1710	− 680 − 1540	− 400 − 760	− 350	− 214	− 119	− 54	− 360	− 140	− 53	− 36	− 18	+ 4	+ 37	+ 62	+ 150 + 114	+ 244 + 208
> 400 — 450	− 1500 − 1900	− 760 − 1160	− 440 − 840	− 230	− 135	− 68	− 20	0	0	0	0	+ 20	+ 45	+ 80	+ 108	+ 166 + 126	+ 272 + 232
> 450 — 500	− 1650 − 2050	− 840 − 1240	− 480 − 880	− 385	− 232	− 131	− 60	− 400	− 155	− 63	− 40	− 20	+ 5	+ 40	+ 68	+ 172 + 132	+ 292 + 252

جدول 1 . 9 منطقة التفاوت للثقوب .

FOR DIAMETER STEP IN MILLIMETRE	ISO - TOLERANCE ZONE FOR HOLE — VALUES OF DEVIATIONS IN MICRONS (1μ = 0.001 mm)																
	A_{11}	B_{11}	C_{11}	D_{10}	E_9	F_8	G_7	H_{11}	H_9	H_8	H_7	J_{S7}	K_7	N_7	P_7	R_7	S_7
— 3	+ 330 + 270	+ 200 + 140	+ 120 + 60	+ 60 + 20	+ 39 + 14	+ 20 + 6	+ 12 + 2	+ 60 0	+ 25 0	+ 14 0	+ 10 0	+ 5 − 5	0 − 10	− 4 − 14	− 6 − 16	− 10 − 20	− 14 − 24
> 3 — 6	+ 345 + 270	+ 215 + 140	+ 145 + 70	+ 78 + 30	+ 50 + 20	+ 28 + 10	+ 16 + 4	+ 75 0	+ 30 0	+ 18 0	+ 12 0	+ 6 − 6	+ 3 − 9	− 4 − 16	− 8 − 20	− 11 − 23	− 15 − 27
> 6 — 10	+ 370 + 280	+ 240 + 150	+ 170 + 80	+ 98 + 40	+ 61 + 25	+ 35 + 13	+ 20 + 5	+ 90 0	+ 36 0	+ 22 0	+ 15 0	+ 7.5 − 7.5	+ 5 − 10	− 4 − 19	− 9 − 24	− 13 − 28	− 17 − 32
> 10 — 18	+ 400 + 290	+ 260 + 150	+ 205 + 95	+ 120 + 50	+ 75 + 32	+ 43 + 16	+ 24 + 6	+ 110 0	+ 43 0	+ 27 0	+ 18 0	+ 9 − 9	+ 6 − 12	− 5 − 23	− 11 − 29	− 16 − 34	− 21 − 39
> 18 — 30	+ 430 + 300	+ 290 + 160	+ 240 + 110	+ 149 + 65	+ 92 + 40	+ 53 + 20	+ 28 + 7	+ 130 0	+ 52 0	+ 33 0	+ 21 0	+ 10.5 − 10.5	+ 6 − 15	− 7 − 28	− 14 − 35	− 20 − 41	− 27 − 48
> 30 — 40	+ 470 + 310	+ 330 + 170	+ 260 + 120	+ 180	+ 112	+ 64	+ 34	+ 160	+ 62	+ 39	+ 25	+ 12.5	+ 7	− 8	− 17	− 25	− 34
> 40 — 50	+ 480 + 320	+ 340 + 180	+ 290 + 130	+ 80	+ 50	+ 25	+ 9	0	0	0	0	− 12.5	− 18	− 33	− 42	− 50	− 59
> 50 — 65	+ 530 + 340	+ 380 + 190	+ 330 + 140	+ 220	+ 134	+ 76	+ 40	+ 190	+ 74	+ 46	+ 30	+ 15	+ 9	− 9	− 21	− 30 − 60	− 42 − 72
> 65 — 80	+ 550 + 360	+ 390 + 200	+ 340 + 150	+ 100	+ 60	+ 30	+ 10	0	0	0	0	− 15	− 21	− 39	− 51	− 32 − 62	− 48 − 78
> 80 — 100	+ 600 + 380	+ 440 + 220	+ 390 + 170	+ 260	+ 159	+ 90	+ 47	+ 220	+ 87	+ 54	+ 35	+ 17.5	+ 10	− 10	− 24	− 38 − 73	− 58 − 93
> 100 — 120	+ 630 + 410	+ 460 + 240	+ 400 + 180	+ 120	+ 72	+ 36	+ 12	0	0	0	0	− 17.5	− 25	− 45	− 59	− 41 − 76	− 66 − 101
> 120 — 140	+ 710 + 460	+ 510 + 260	+ 450 + 200	+ 305	+ 185	+ 106	+ 54	+ 250	+ 100	+ 63	+ 40	+ 20	+ 12	− 12	− 28	− 48 − 88	− 77 − 117
> 140 — 160	+ 770 + 520	+ 530 + 280	+ 460 + 210	+ 145	+ 85	+ 43	+ 14	0	0	0	0	− 20	− 28	− 52	− 68	− 50 − 90	− 85 − 125
> 160 — 180	+ 830 + 580	+ 560 + 310	+ 480 + 230													− 53 − 93	− 93 − 133
> 180 — 200	+ 950 + 660	+ 630 + 340	+ 530 + 240													− 60 − 106	− 105 − 151
>200 — 225	+1030 + 740	+ 670 + 380	+ 550 + 260	+ 355	+ 215	+ 122	+ 61	+ 290	+ 115	+ 72	+ 46	+ 23	+ 13	− 14	− 33	− 63 − 109	− 113 − 159
>225 — 250	+1110 + 820	+ 710 + 420	+ 570 + 280	+ 170	+ 100	+ 50	+ 15	0	0	0	0	− 23	− 33	− 60	− 79	− 67 − 113	− 123 − 169
>250 — 280	+1240 + 920	+ 800 + 480	+ 620 + 300	+ 400	+ 240	+ 137	+ 69	+ 320	+ 130	+ 81	+ 52	+ 26	+ 16	− 14	− 36	− 74 − 126	− 138 − 190
>280 — 315	+1370 +1050	+ 860 + 540	+ 650 + 330	+ 190	+ 110	+ 56	+ 17	0	0	0	0	− 26	− 36	− 66	− 88	− 78 − 130	− 150 − 202
>315 — 355	+1560 +1200	+ 960 + 600	+ 720 + 360	+ 440	+ 260	+ 151	+ 75	+ 360	+ 140	+ 89	+ 57	+ 28.5	+ 17	− 16	− 41	− 87 − 144	− 169 − 226
>355 — 400	+1710 +1350	+ 1040 + 680	+ 760 + 400	+ 210	+ 125	+ 62	+ 18	0	0	0	0	− 28.5	− 40	− 73	− 98	− 93 − 150	− 187 − 244
>400 — 450	+1900 +1500	+ 1160 + 760	+ 840 + 440	+ 480	+ 290	+ 165	+ 83	+ 400	+ 155	+ 97	+ 63	+ 31.5	+ 18	− 17	− 45	− 103 − 166	− 209 − 272
>450 — 500	+2050 +1650	+ 1240 + 840	+ 880 + 480	+ 230	+ 135	+ 68	+ 20	0	0	0	0	− 31.5	− 45	− 80	− 108	− 109 − 172	− 229 − 292

جمهورية العراق
وزارة التعليم العالي و البحث العلمي
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية / النجف

قسم هندسة تقنيات الطيران

المرحلة الثانية

أسئلة الامتحان النهائي للعام الدراسي

٢٠١٥-٢٠١٦

الدور الثاني

شعبة ضمان الجودة و الأداء الجامعي

قسم الطيران
ح/ب

ATU University
Technical College Engineering - Annajaf

Dep. : Automotive & Aeronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 3 hours.

****

Note: Endeavor All Questions

Group (A): Mechanics of Materials Conceptions (20 Marks)

Q1: Choose the appropriate answer (10 Marks)

(1) The stress concept relies on:

(A) Continuum elements. (B) Uniform distribution load. (C) Regulation body with applied load. (D) Irregulation body with applied load.

(2) Shear strain may be:

(A) Normal angle. (B) Inclined angle. (C) Radial deformation. (D) Small displacement.

(3) If we have a vertical-rigid bar, the useful analysis of load is:

(A) Whole body. (B) Divide body. (C) A&B. (D) Non all.

(4) Allowable stress of the body can be recognized by:

(A) Normal load. (B) Area. (C) Internal load. (D) External load.

(5) The distance between deflected area and less deflected area based on Saint-Venant's principles are:

(A) $\sigma_{Max} = 1.02\ \sigma_{Av}$. (B) $\sigma_{Max} \simeq 1.02\ \sigma_{Av}$. (C) $\sigma_{Max} \approx 1.05\ \sigma_{Av}$. (D) $\sigma_{Max} = 1.04\ \sigma_{Av}$.

Q2: What are the parameters replacing in circular shaft instead of axial state that is producing by Saint-Venant's? Prove this mathematically. (10 Marks)

ATU University
Technical College Engineering - Annajaf

Dep. : Automotive & Aeronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 2 hours.

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Group (B): Mechanics of Materials Problems (80 Marks)

Q1: The state of stresses is referring to in figure (1) on the element. Determine (a) the principal stress and (b) the maximum in-plane shear stress and average normal stress at the point (c) the orientation of the element in each case. Sketch the results on each element. (30 Marks)

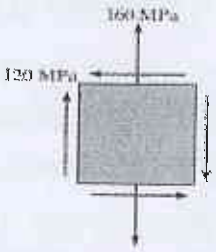


Figure (1) Rotating element

Q2: The gears attached to the fixed-end Steel shaft are subjected to the torques shown in figure (2). If the shear modulus of elasticity is (80 GPa) and the shaft has a diameter of 14 mm, determine the displacement of the tooth *P* on gear *A*. The shaft turns freely within the bearing at *B*. (20 Marks)

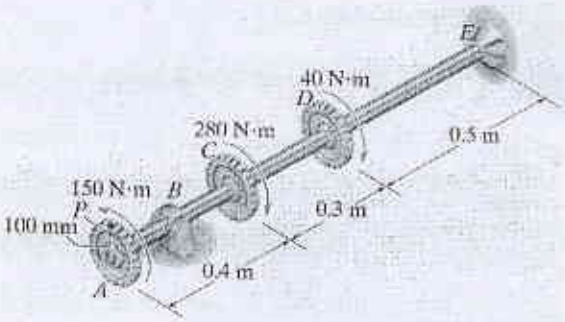


Figure (2) Fixed Steel shaft

Q3: Rigid beam AB rests on the two short posts shown in figure (3). AC is made of Steel and has a diameter of 20 mm, and BD is made of Aluminum and has a diameter of 40 mm. Determine the displacement of point F on AB if a vertical load of 90 kN is applied over this point. Take $E_{st} = 200$ GPa, $E_{al} = 70$ GPa. (30 Marks)

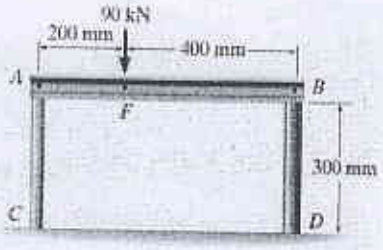


Figure (3) Beam supported by two posted

GOOD LUCK

Examiner	Head of Aeronautical Dep.	Head of Automobile Dep.
A.Lecturer: Mohammed A. Abass	A. Prof. Dr. Ali S. Baqir	Dr. Haider H. Al-Abdili

0024261

قسم الطيران

Al-Furat Al-Awsat Technical University
Aeronautical Technical Engineering Department
Subject/ Programming
Class/ Second
Time/ 2 hours

2st Term Exam 2015-2016

Note: - Answer four question only

Q1/ create matrix as

$$c = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

1- add fourth column equal to [4,5,7]
2- find the sum of diagonal elements
3- delete the odd column
4- find the matrix dimensions
5- find transpose of matrix (c)

Q2/ write a program in MATLAB that return (1) when input number odd and return (2) when input number is even.

Q3/ write a program using GUI to enter three function (sine(t) ,cosine(t), exponential(t)) using pop-up menu and draw the function select in axes?

Q4/ what is the difference between:

1. Union and Subtract.
2. Line and pline.

Q5/ write a program using GUI to enter any number and check it, if odd find factorial and if even find square of the number.

(25 mark for each question)

Good Luck

Lecture
Rusul Sabah

Head of Dept
Dr. Ali Shakir

0024261

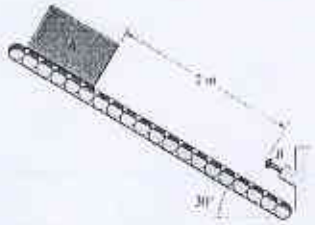
قسم الطيران
ج / ب

Ministry of Higher Education & Scientific Research
Al-Furat Al-Awsat Technical University
Engineering Technical College- Najaf
Department of Aeronautical Eng. Tech.

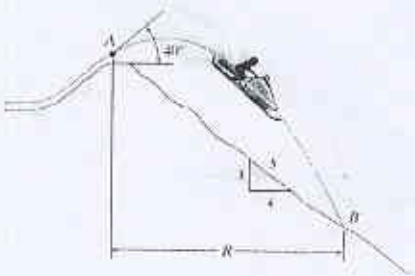
00265420l

Class Level: 2nd level
Course Title: Dynamics
Instructor: Dr. Assaad Al-Sahlani
Final Exam (C) / 2015-2016
Time: 3 hours

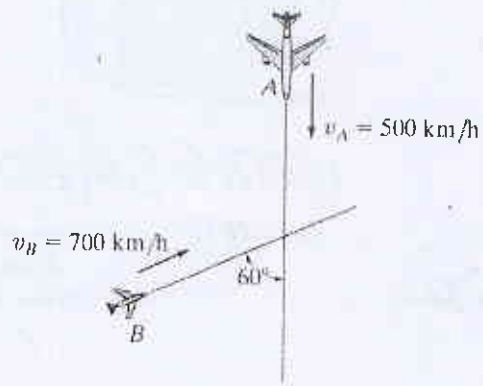
Q1: The package starts from rest and slides down the smooth ramp. The hydraulic device B exerts a constant 2000-N force and brings the package to rest in a distance of 100 mm from the point where it makes contact. What is the mass of the package? **(20 points)**



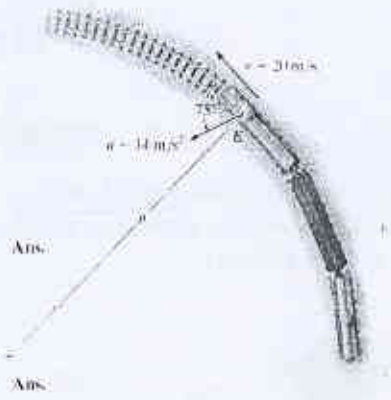
Q2: The snowmobile is traveling at 10 m/s when it leaves the embankment at A. Determine the time of flight from A to B and the range R of the trajectory. **(20 points)**



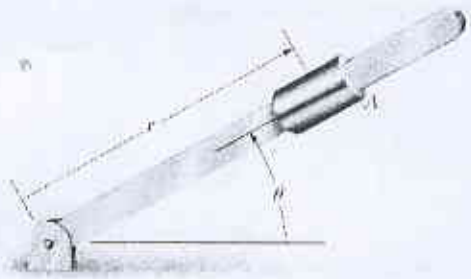
Q3: Two planes, A and B, are flying at the same altitude. If their velocities are $V_A = 500$ km/h and $V_B = 700$ km/h such that the angle between their straight-line courses is $\theta = 60^o$, determine the velocity of plane B with respect to plane A. **(20 points)**



Q4: At a given instant the train engine at E has a speed of 20 m/s and an acceleration of 14 m/s^2 acting in the direction shown. Determine the rate of increase in the train's speed and the radius of curvature ρ of the path. **(20 points)**



Q5: The polar coordinates of the collar A are given as functions of time in seconds by $r = 1 + 0.2t^2$ m and $\theta = 2t^2$ rad. What are the magnitudes of the velocity and acceleration of the collar at t = 2 s?. **(20 points)**



Good Luck!

00265420!

Cordially !

Head of Dept.
Assist. Prof. Dr. Ali Al Jaberi

Instructor
Dr. Assaad Al Sahlani

Technical College of Najaf *Subject: Manufacturing processes*

Airplane Department *Class Level : 2nd Stage*

Examiner: Oras khudayer *Second Attempt (2015-2016)* *Time : hrs.*

Q1/ Identify some of the details and decisions that are included within the scope of process planning ? (20 D)

.....

Q2/ (A) What are the differences between types of gas welding techniques ? (10 D)

(B) Draw the different types of flames used in gas welding. How would you identify these flames? What are the specific uses of each of these flames? (15 D)

(C) State the important functions of flux coatings of electrodes used in minual metal arc welding processes. Also, give the main ingredients of flux coatings used in arc welding processes. ? (20 D)

.....

Q3/ Choose Three only :-

(a) What is the main alloying addition made to zinc to produce zinc based die casting ?

(b) Indicate the characteristic that make these articles useful in engineering practice?

(c) Describe one piece of equipment suitable for the manufacture of these products?

(d) Indicate ,with reason , whether or not the equipment you have described is also suitable for making alumimium die castings? (20 D)

.....

Q4/ Choose one only :-

(A) A cast iron cylinder of 400 mm outside diameter , 64 mm inside diameter , 120 mm long is to be obtained by sand casting . Design requisite pattern assuming that the internal hole is to be finished by machining? (15 D)

(B) Compare the Cu-Zn and Cu-Ni ranges of alloys from the following aspects where applicable : (1) suitability for hot and cold working , (2) effect the additional alloying elements, (3) susceptibility to , and effect of , heat treatment ,(4) typical compositions and uses ? (15 D)

Lecturer **Assist. Prof. Dr.Ali Sh. Baqir**

قسم الطيران
ح/ب

٥٥٢٤٢١

ATU University
Technical College Engineering - Annajaf

Dep. : Automotive & Aeronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 3 hours.

****

Note: Endeavor All Questions

Group (A): Mechanics of Materials Conceptions (40 Marks)

Q1: The following element shown in figure (1) be stable without rotate. (20 Marks)

The value of:

(1) Stress ($\sigma_{\dot{x}}$) equal:

(A) σ_{av} (B) $\sigma_{av} + \sigma_d$ (C) $\sigma_{av} - \tau_{xy}$ (D) $-\tau_{xy}$

(2) Stress ($\tau_{\dot{x}\dot{y}}$) equal:

(A) τ_{xy} (B) $-\sigma_d$ (C) $\sigma_d + \tau_{xy}$ (D) Non all.

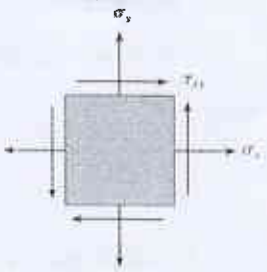


Figure (1) Un-rotating element

Q2: Interpret the following cases: (20 Marks)

(1) Normal load on cross-sectional area.
(2) Tangential load on cross-sectional area.
(3) Strain gauge normal to dummy resistance.
(4) 0.2% true strain.
(5) Necking ratio (R/a).

Group (B): Mechanics of Materials Problems (60 Marks)

Q1: The rigid bar AB shown in figure (2) is supported by a steel rod AC having a diameter of (20) mm and an aluminum block having a cross-sectional area of (1800) mm^2. The (18) mm diameter pins at A and C are subjected to single shear. If the failure stress for the steel and aluminum are $(\sigma_{st})_{fail} = 680\ MPa$ and $(\sigma_{al})_{fail} = 70\ MPa$ respectively, and the failure shear stress for each pin is $\tau_{fail} = 900\ MPa$, determine the largest load P that can be applied to the bar. Apply a factor of safety of (FS = 2). (20 Marks)

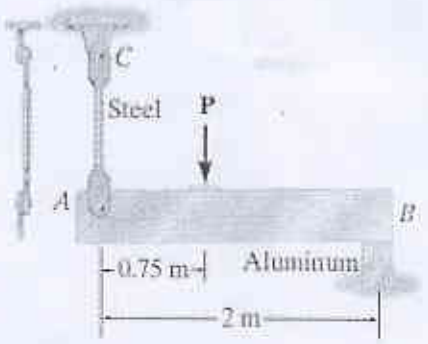


Figure (2) Rigid bar supported by Steel rod and Aluminum block

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ATU University
Technical College Engineering - Annajaf

Dep. : Automotive & Acronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 2 hours.

****

Q2: Answer all branches: (40 Marks)

(A) A strain gauge is bonded to a tensile specimen along the axial direction to measure the strain in that direction. To eliminate the effect of temperature change, a compensating gauge (or dummy) is mounted on a separate piece of the same material as the specimen and placed closed to it. The figure (3) prove that the apparent strains due to temperature change ΔT will be canceled out if a quarter bridge used. Suggest the output balanced voltage used to measuring the strain of this specimen.

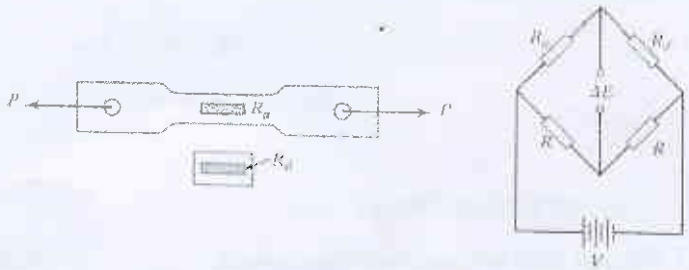


Figure (3) Tensile specimen fixed with a strain gauge resistance

(B) Draw S.F.D and B.M.D to the case that is indicating in figure (4):

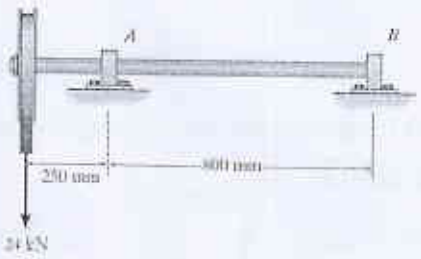


Figure (4) Bearing shaft

GOOD LUCK

Examiner	Head of Aeronautical Dep.	Head of Automobile Dep.
A.Lecturer: Mohammed A. Abass	A. Prof. Dr. Ali S. Baqir	Dr. Haider H. Al-Abdili

قسم الطيران
ب/ ٢

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
هيئة التعليم التقني
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية / نجف

القسم : هندسة تقنيات الطيران
المرحلة : الثانيه
المادة: رياضيات/٢
زمن الامتحان:٣ ساعات
التاريخ: / /2016

الامتحان النهائي- العام الدراسي ٢٠١٥/٢٠١٦

Q1// Solve the following equations: **(choose only four).** (40)

1) $\frac{dy}{dx} + x\sec y = 0$

2) $\left(x\cos\frac{y}{x} + y\sin\frac{y}{x}\right)ydx - x\left(y\sin\frac{y}{x} - x\cos\frac{y}{x}\right)dy = 0$

3) $\frac{dy}{dx} = x^3y^2 + xy$

4) $\frac{d^4y}{dx^4} - 2\frac{d^2y}{dx^2} + 4y = 0$

5) $\frac{d^2y}{dx^2} - \frac{dy}{dx} = -8x + 3$

Q2// a) Find the derivative of $f(x,y,z) = x^3 - xy^2 - z$ at point $p_0(1,1,0)$in the direction of the vector $\vec{A}$=2i – 3j +6k. (20)

b) Find the extreme value of $f(x,y) = xy$.

Q3// Graph the following (20)

1) $r = \sin\theta - 2$

2) $r = 2(1 + \cos\theta)$

Q4//Evaluate the following integral:**(choose only two).** (20)

1) Find the area of region bounded by $y = x$ and $y = x^2$ in the first quadrant.

2) $\int_1^2\int_x^{2x}\frac{x}{y}dydx$

3) $\int_0^2\int_x^2 y^2\sin xy\ dydx$

Good Luck

رئيس القسم
د.علي شاكر

مدرس المادة
رسل عاشور جواد

قسم الطيران
ط/

القسم : قسم هندسة تقنيات الطير
المرحلة :الثانية
المادة: Thermodynamic
وقت الامتحان: ساعتان
التأريخ: 2016/09/ 21

وزارة التعليم العالي والبحث العلمي
جامعة الفرات الاوسط التقنية
الكلية التقنية الهندسية- نجف

02426001

الامتحان النهائي الدور الثاني للعام 2015-2016

Note: 1) Allow using tables

Q1/ CHOOSE (A) or (B) (15M)

(A) A test cylinder with constant volume of 0.1 L contains water at the critical point. It now cools down to room temperature of 20°C. Calculate the heat transfer from the water.

(B) Water flowing in a line at 400 kPa, saturated vapor, is taken out through a valve to 100 kPa. What is the temperature as it leaves the valve assuming no changes in kinetic energy and no heat transfer?

Q2/ (A) The thermal efficiency of the Rankine cycle is improved by many methods, what are these methods? **(5M)**

(B) What Advantages of ***Regenerative*** cycle over ***Simple Rankine cycle***? **(5M)**

Q3/ (A) Consider a simple ideal Rankine cycle with fixed turbine inlet temperature and condenser pressure. What is the effect of increasing the boiler pressure on: **(5M)**

1) Pump work input: (*a*) increases, (*b*) decreases, (*c*) remains the same
2) Turbine work output: (*a*) increases, (*b*) decreases, (*c*) remains the same
3) Heat supplied: (*a*) increases, (*b*) decreases, (*c*) remains the same
4) Heat rejected: (*a*) increases, (*b*) decreases, (*c*) remains the same
5) Cycle efficiency: (*a*) increases, (*b*) decreases, (*c*) remains the same

(B) The single-stage compression process of an ideal Brayton cycle without regeneration is replaced by a multistage compression process with intercooling between the same pressure limits. As a result of this modification: **(5M)**

1) Compressor work (*a*) increases, (*b*) decreases, (*c*) remains the same
2) Back work ratio (*a*) increases, (*b*) decreases, (*c*) remains the same
3) Thermal efficiency (*a*) increases, (*b*) decreases, (*c*) remains the same

Q4/ A power plant with one closed feedwater heater has a condenser temperatureof45°C,a maximum pressure of 5 MPa, and boiler exit temperature of 900°C. Extraction steam at 1 MPa to the feedwater heater condenses and is pumped up to the 5 MPa feedwater line, where all the water goes to the boiler at 200°C. Find the fraction of extraction steam flow and the two specific pump work inputs. **(15M)**

Q5/ A house contains air at 25°C and 65 percent relative humidity. Will any moisture condense on the inner surfaces of the windows when the temperature of the window drops to 10°C? And the enthalpy per unit mass of dry air. **(15M)**

Q6/ A 0.3-m^3 rigid tank is filled with saturated liquid water at 200°C. A valve at the bottom of the tank is opened, and liquid is withdrawn from the tank. Heat is transferred to the water such that the temperature in the tank remains constant. Determine the amount of heat that must be transferred by the time one-half of the total mass has been withdrawn. **(15M)**

Q7/ Consider an ideal gas-turbine cycle with two stages of compression and two stages of expansion. The pressure ratio across each stage of the compressor and turbine is 3. The air enters each stage of the compressor at 300 K and each stage of the turbine at 1200 K. Determine the back work ratio and the thermal efficiency of the cycle, assuming (*a*) no regenerator is used and (*b*) a regenerator with 75 percent effectiveness is used. **(20M)**

Examiner

Basil Noori Merza

02426001

Head of department

Dr. Ali Shaker

قسم الطيران
ج/ب

1400261

المرحلة الثانية
لعام نظرية طيران
الزمن ثلاث ساعات

Attempt all questions.

All questions have equal marks

Q1: Why don't we use the center of pressure as reference point in aircraft dynamics?

Q2: What is the difference between the real area of wings and the area used in aerodynamic calculation?

Q3: Explain the behavior of drag coefficient with the change of angle of attack.

Q4: A small plane of 500kg mass moves horizontally of 1000m height. The acceleration of the plane is 10 m/s^2, if the drag of the plane is 10000N, what is the thrust force of the engine?

Q5: An airplane is steadily gliding to land with an angle of 10°. If the lift force is 500 000 N, what is the drag force of that plane?

Q6: A plane steadily climbing with an angle of 15°. The mass of the plane is 600 kg, while the drag force is 2000N. What is the drag force of the plane?

Q7: What is the difference between the NACA codes of four and five digits?

Q8: Describe how would the supersonic planes create drag due to its high speed.

Q9: How could the parasite drag be eliminated?

Q10: What is the supercritical airfoil? Sustain your answer with sketches.

Good Luck

Dr. Wahab Sajid

Ali. Sh. Bagir

قسم الطيران
ط/

Al-Furat Al-**Awsat Technical** University
Aeronautical **Technical Engineering** Department
Subject/ **Programming**
Class level/ **Second** stage
Time/ 3 **hours**

3rd attempt 2015-2016

(25 mark for each question)

Q1/ write a program in MATLAB that return (1) when input number odd and return (2) when input number is even.

Q2/ write a program in GUI to work as calculator by entering two number and find basic arithmetic operation on it (*,+,-, /).

Q3/ what is the difference between: **(chose one)**

1. Union and Subtract.
2. Line and pline.

Q4/ write a program in GUI to enter any number and print status if (even or odd).

Good Luck

Lecture

Rusul Sabah

Head of Dept

Assist. Prof. Dr. Ali Shakir

جمهورية العراق
وزارة التعليم العالي و البحث العلمي
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية / النجف

قسم هندسة تقنيات الطيران

المرحلة الثانية

أسئلة الفصل الثاني للعام الدراسي

٢٠١٥-٢٠١٦

شعبة ضمان الجودة و الأداء الجامعي

قسم الطيران
ح/ط

Ministry of Higher Education and Scientific Research
Foundation of Technical Education
Al-Furat Al-Awsat Technical University
Technical Engineering College / Najaf

Departments: Automotive Technical Engineering & Aeronautical Technical Engineering
Stage: Second
Subject: Fluid Mechanics
Exam Time: Two Hours

The Second Semester Exam Questions for the Academic Year 2015-2016
First Semester

Note: Answer Four Questions Only. All Questions have same marks

Q1/ A piezometer and a Pitot tube are tapped into a 3-cm- diameter horizontal water pipe as shown in **Fig.1**, and the height of the water columns are measured to be 20 cm in the piezometer and 35 cm in the Pitot tube (both measured from the top surface of the pipe). Determine the velocity at the center of the pipe.

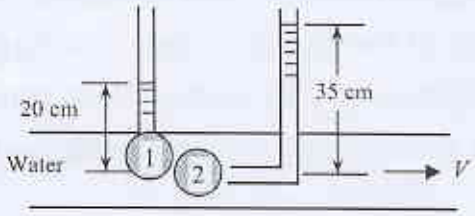


Fig. 1

Q2/ The water level in a tank is 20 m above the ground. A hose is connected to the bottom of the tank, and the nozzle at the end of the hose is pointed straight up as shown in **Fig.2**. The tank cover is airtight, and the air pressure above the water surface is 2 atm gage. The system is at sea level. Determine the maximum height to which the water stream could rise (take the density of water $\rho = 1000 \frac{kg}{m^3}$).

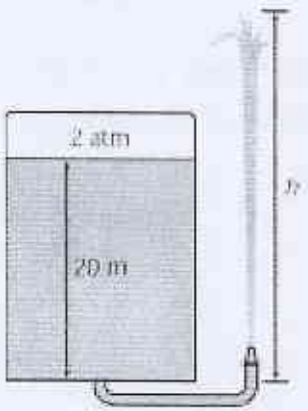


Fig.2

Q3/ A 3-in-diameter horizontal water jet having a velocity of 140 ft/s strikes a curved plate, which deflects the water 180° at the same speed (**as shown in Fig.3**). Ignoring the frictional effects, determine the force required to hold the plate against the water stream (take the density of water $\rho = 62.4\ Ibm/ft^3$, and momentum flux correction factor $\beta = 1$).

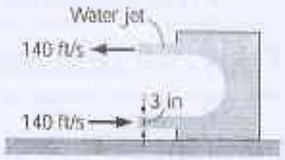


Fig.3

Q4/ Consider a liquid in a cylindrical container in which both the container and the liquid are rotating as a rigid body (solid-body rotation). The elevation difference h between the center of the liquid surface and the rim of the liquid surface is a function of angular velocity ω, fluid density ρ, gravitational acceleration g, and radius R (**as shown in Fig. 4**). Use the method of repeating variables to find a dimensionless relationship between the parameters. Show all your work.

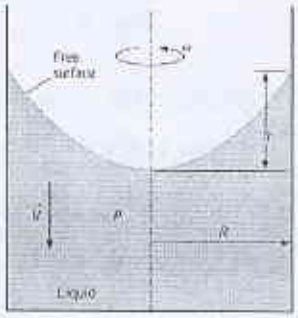


Fig.4

Q5/ Water at 10°C ($\rho = 999.7\ kg/m^3$ and $\mu = 1.307 \times 10^{-3}\ kg/m.s$) is flowing steadily in a 0.20-cm-diameter, 15-m-long pipe at an average velocity of 1.2 m/s. Determine (a) the pressure drop, and (b) the head loss.

Good Luck

Lecturer
Dr. Dhafeer M. AL-Shamkhi

Head of Department
Dr. Hiader H.

Assist. Prof. Dr. Alish. Bagir

قسم الطيران
٢/b

ATU University
Technical College Engineering - Annajaf

Dep. : Automotive & Aeronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 2 hours.

****

Note: Endeavor All Questions

Group (A): Mechanics of Materials Conceptions (40 Marks)

Q1: What are the parameters replacing in circular shaft instead of axial state that is producing by Saint-Venant's? Prove this mathematically. (20 Marks)

Q2: The following element shown in figure (1) be stable without rotate. The value of: (20 Marks)

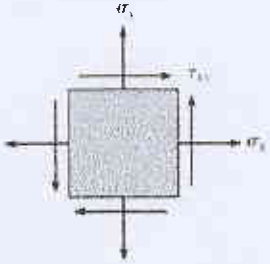
(1) Stress ($\sigma_{\acute{x}}$) equal:

(A) σ_{av} (B) $\sigma_{av} - \sigma_d$ (C) $\sigma_{av} - \tau_{xy}$ (D) $-\tau_{xy}$

(2) Stress ($\tau_{\acute{x}\acute{y}}$) equal:

(A) τ_{xy} (B) $-\sigma_d$ (C) $\sigma_d + \tau_{xy}$ (D) Non all.

Figure (1) Un-rotating element



Group (B): Mechanics of Materials Problems (60 Marks)

Q1: Draw S.F.D and B.M.D to one of the cases that is indicating in figure (2) and (3): (20 Marks)

Figure (2) Bearing shaft

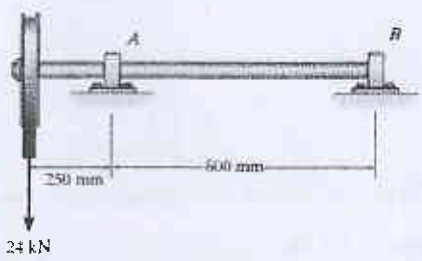
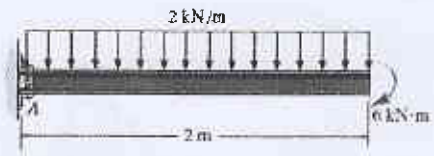


Figure (3) Cantilever beam



Q2: The solid 30-mm-diameter shaft shown in figure (4) is used to transmit the torques applied to the gears. Determine the absolute shear stresses on the shaft. (20 Marks)

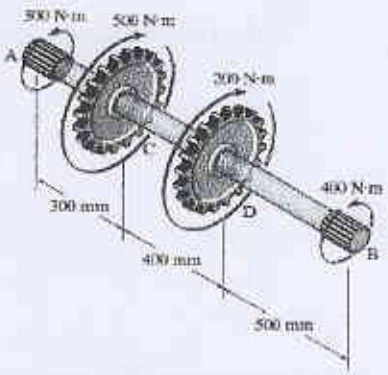


Figure (4) Transmitting shaft

****

Q3: The state of stresses is referring to in figure (5) on the element. Determine (a) the principal stress and (b) the maximum in-plane shear stress and average normal stress at the point. Specify the orientation of the element in each case. Sketch the results on each element. (20 Marks)

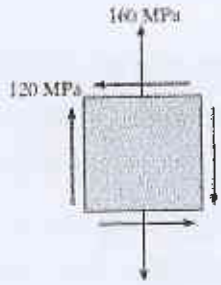


Figure (5) Rotating element

GOOD LUCK

Examiner
A.Lecturer: Mohammed A. Abass

Head of Aeronautical Dep.
A. Prof. Dr. Ali S. Baqir

Head of Automobile Dep.
Dr. Haider H. Al-Abdili

قسم الطيران
ط/ ح

Ministry of Higher Education
& Scientific Research
Al-Furat Al-Awsat Technical University
Najaf Engineering Technical College
Aeronautical Eng. Tech. Department

Subject: Computer Sc.
Date:
Time: 2 hours
Class Level: 2

Q1/ Give five drawing tool used in drawing 3D objects and explain each of them by example with command for each tool? (25 marks)

Q2/ select the correct choice for **five** only in the following: (25 marks)

1-the ---------- command in AutoCAD program can be used to quickly create a line between two nonparallel lines.

a-fillet b-chamfer c-array d-scale

2-Which object doesn't have an end point?

a-circle b-Arc c-line d-Rectangle

3-objects are rotated around the

a-Base point b-Bottom right of the object c-Centre of object d-origin

4-you can use the ---------- the command in AutoCAD to connect two objects quickly with a smoothly fitted are of a specified radius or a rounded edge.

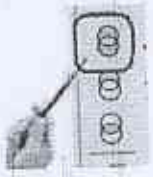
a-Fillet b-chamfer c-Arc d-mirror

5-The---------- command allows you to copy selected objects (lines, arcs, circles or others) and place the copy at a specific distance from the original

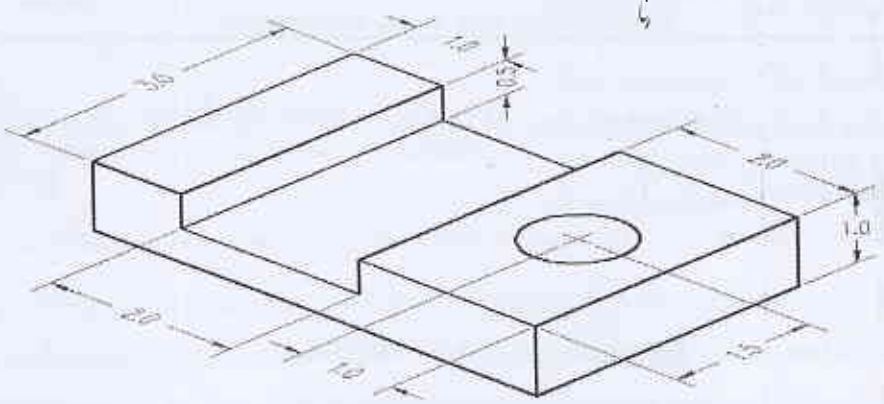
a-Break at point b-offset c-scale d-Array

6-the Icon has circle on it is a symbol of ---------- command.

a-Union b-Subtraction c-Intersect



Q3/Write all command required to draw the following figure: (20 marks)



Q4/what is the difference between: (30 marks)

1. Extrude and Revolve.
2. Line and Pline.
3. Union and Subtract.

Good Luck

Lecture

MS.c. Rusul Sabah

Head of Dept

Dr. Ali Shakir

قسم الطيران
ط/

Ministry of Higher Education
& Scientific Research
Al-Furat Al-Awsat Technical University
Najaf Engineering Technical College
Aeronautical Eng. Tech. Department

Subject: Computer Sc.
Date:
Time: 2 hours
Class Level: 2

Q1/ Give five drawing tool used in drawing 3D objects and explain each of them by example with command for each tool? (25 marks)

Q2/ select the correct choice for **five** only in the following: (25 marks)

1-the ---------- command in AutoCAD program can be used to quickly create a line between two nonparallel lines.

a-fillet b-chamfer c-array d-scale

2-Which object doesn't have an end point?

a-circle b-Arc c-line d-Rectangle

3-objects are rotated around the

a-Base point b-Bottom right of the object c-Centre of object d-origin

4-you can use the ---------- the command in AutoCAD to connect two objects quickly with a smoothly fitted are of a specified radius or a rounded edge.

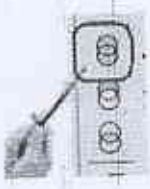
a-Fillet b-chamfer c-Arc d-mirror

5-The---------- command allows you to copy selected objects (lines, arcs, circles or others) and place the copy at a specific distance from the original

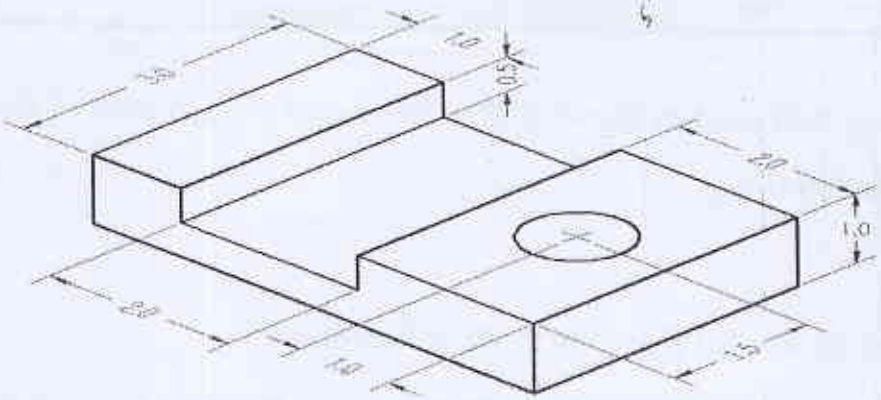
a-Break at point b-offset c-scale d-Array

6-the Icon has circle on it is a symbol of ---------- command.

a-Union b-Subtraction c-Intersect



Q3/Write all command required to draw the following figure: (20 marks)



Q4/what is the difference between: (30 marks)

1. Extrude and Revolve.
2. Line and Pline.
3. Union and Subtract.

Good Luck

Lecture

MS.c. Rusul Sabah

Head of Dept

Dr. Ali Shakir

قسم الطيران
ب/ ١

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
هيئة التعليم التقني
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية / نجف

القسم : هندسة تقنيات الطيران
المرحلة :الثانية
المادة:رياضيات /٢
زمن الامتحان: ساعتان
التاريخ: / /2016

إمتحان الفصل الثاني- العام الدراسي ٢٠١٥/٢٠١٦

Answer All Questions

Q1// Graph the following limacons: (30)

1) $r = -\frac{1}{2} + \sin\theta$

2) $r^2 = 4a^2\cos\theta$

Q2// Find the area inside the large loop of limacon $r = 2\cos\theta + 1$,but outside the small loop of it. (20)

Q3//Evaluate the following integral: (30)

1) $\int_0^1 \int_0^{x^2} e^{y/x}\, dydx$

2) $\int_{-1}^1 \int_0^{\sqrt{1-x^2}} dydx$

3) $\int_0^{\pi} \int_x^{\pi} \frac{\sin y}{y}\, dydx$

Q4// Find the polar moment of inertia about the origin of thin plate of density $\rho(x,y) = 1$ bounded by quarter circle $x^2 + y^2 = 1$,in the first quadrant. (20)

Good Luck

رئيس القسم
أ.م. د.علي شاكر

مدرس المادة
م.م.رسل عاشور

قسم الطيران
C/B

وزارة التعليم العالي والبحث العلمي
جامعة الفرات الاوسط التقنية
الكلية التقنية الهندسية- نجف

القسم : قسم هندسة تقنيات الطيران
المرحلة :الثانية
المادة: Thermodynamic
وقت الامتحان: ساعتان
التاريخ: 2016/04/ 30

امتحان الفصل الثاني للعام 2015-2016

Note: 1) Answer all the questions

2) Allow using tables

Q1/

1. *When are the dry-bulb and dew-point temperatures identical?* ***(5M)***

2. *In air-standard Brayton cycle :* ***(15M)***

A- *prove that:* ***(10M)***

$$\eta_{th} = 1 - \frac{1}{r_p^{\frac{k-1}{k}}}$$

B- *Draw the figure on T-S plane with different pressure ratios and the same turbine inlet temperature.* ***(5M)***

3. *Draw the figure on (T-S)and (P-v) plane for Regenerative gas turbine with intercooling and reheat cycle.* ***(10M)***

Q2/ CHOOSE A OR B(35M)

A/ *Air enters the compressor of an ideal air-standard Brayton cycle at 100 kPa, 300K, with a volumetric flow rate of 5 m^3/s. The compressor pressure ratio is 10. The turbine inlet temperature is 1400 K. Determine* ***(a)*** *the thermal efficiency of the cycle,* ***(b)*** *the back work ratio,* ***(c)*** *the net power developed, in kW. A regenerator is incorporated in the cycle of Determine the thermal efficiency for a regenerator effectiveness of 80%.*

B/ *Air is compressed from 100 kPa, 300 K to 1000 kPa in a two-stage compressor with intercooling between stages. The intercooler pressure is 300 kPa. The air is cooled back to 300 K in the intercooler before entering the second compressor stage. Each compressor stage is isentropic. For steady-state operation and negligible changes in kinetic and potential energy from inlet to exit, determine* ***(a)*** *the temperature at the exit of the second compressor stage and* ***(b)*** *the total compressor work input per unit of mass flow.* ***(c)*** *Repeat for a single stage of compression from the given inlet state to the final pressure.*

Q3/ *A 1 kg sample of moist air initially at 21°C, 1 bar, and 70% relative humidity is cooled to 5°C while keeping the pressure constant. Determine* ***(a)*** *the initial humidity ratio,* ***(b)*** *the dew point temperature, in °C, and* ***(c)*** *the amount of water vapor that condenses, in kg.* ***(35M)***

Examiner

Basil Noori Merza

Head of department

Ass.st.prof. Dr. Ali Shaker

قسم الطيران
د/ب

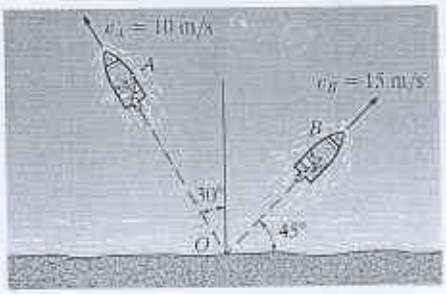
Ministry of Higher Education & Scientific Research
Al-Furat Al-Awsat Technical University
Engineering Technical College- Najaf
Department of Aeronautical Eng. Tech.

Class Level: 2^{nd} level
Instructor: Dr. Assaad Al-Sahlani

Mid-term 2 / 2015-2016

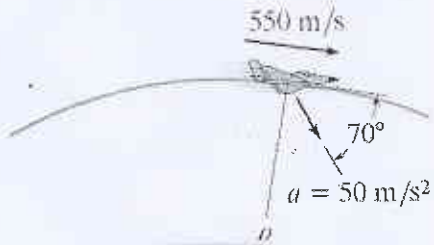
Course Title: Dynamics
Time: 2 hours

Q1: Two boats leave the shore at the same time and travel in the directions shown. If $v_A = 10$ m/s and $v_B = 15$ m/s.



1. Write the velocities V_A and V_B in vector form. **(10 points)**
2. Determine the velocity of boat A relative to boat B (magnitude and direction). **(5 points)**
3. How long (time) after leaving the pier will the boats be 600 m apart? **(5 points)**

Q2: At a given instant the jet plane has a speed of 550 m/s and total acceleration of 50 m/s^2 acting in the direction shown. Determine:



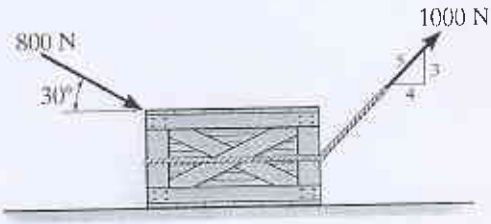
1. The rate of increase in the plane's speed (tangent acceleration). **(10 points)**
2. The radius of curvature ρ of the path. **(10 points)**

Q3: The two masses are released from rest.

1. Draw the free body diagram for each mass. **(10 points)**
2. What are the accelerations for the two masses? **(10 points)**

(*Hint*: Both masses have same acceleration and velocity)

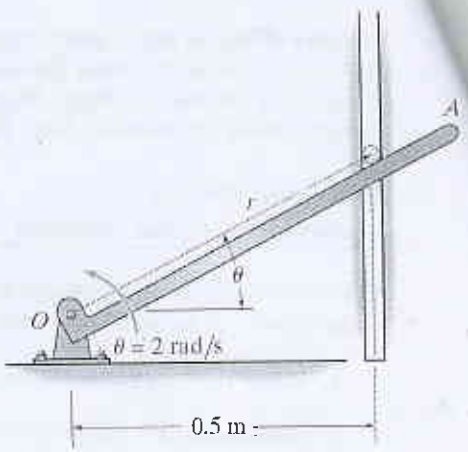
Q4: The crate, which has a mass of 100 kg, is subjected to the action of the two forces. If it is originally at rest and the coefficient of kinetic friction between the crate and the surface is $\mu_k = 0.2$.



1. Draw the free body diagram for the crate. **(10 points)**
2. Determine the distance (d) it slides in order to attain a speed of 6 m/s. **(10 points)**

Next page please...

Q5: The particle has a mass of 0.5 kg and is confined to move along the smooth vertical slot due to the rotation of the arm OA. The rod is rotating with a constant angular velocity $\dot{\theta}$=2 rad/s. Assume the particle contacts only one side of the slot at any instant.



1. Define r in term of θ. **(4 points)**
2. Define a_r and a_θ when $\theta = 30°$. **(6 points)**
3. Draw the free body diagram of the particle. **(5 points)**
4. Determine the force of the rod on the particle and the normal force of the slot on the particle when $\theta = 30°$ and $\dot{\theta}$=2 rad/s. **(5 points)**

Good Luck!

Cordially !

Head of Dept.
Assist. Prof. Dr. Ali Al Jaberi

Instructor
Dr. Assaad Al Sahlani

قسم الطيران

Technical College of Najaf *Subject:Manufacturing processes*

Craft Department *Class: 2nd Stage*

Examiner: Oraskhudayer *First Attempt (2015-2016)* *Time :hrs*

Q1/(A) Define the following :

(1) Electro less plating . (2) Physical vapor deposition . (3) route sheet .

(4) manufacturing engineering. (5) design for life cycle. ?(25 D)

.....

Q2/(A) What is the difference between a basic process and a secondary process ?(15D)

(B) Identify some of the enabling technologies for concurrent engineering ?(10D)

.....

Q3/(A) What are the differences between types of gas welding techniques ? (20 D)

(B)Draw the different types of flames used in gas welding. How would you identify these flames? What are the specific uses of each of these flames? (15 D)

(C)State the important functions of flux coatings of electrodes used in minual metal arc welding processes. Also, give the main ingredients of flux coatings used in arc welding processes. ?(15 D)

.....

Lecturer

H. D.

قسم الطيران
</b

المرحلة: الثانية	وزارة التعليم العالي والبحث العلمي
المادة: نظرية طيران	جامعة الفرات الاوسط التقنية
الزمن: ساعتان	الكلية التقنية النجف
المصحح: د. وسام احمد عبد الواحد	قسم هندسة الطيران

Attempt all questions.

All questions have equal marks

Except for question 6 having 30% of marks.

Q1: Explain with sketches the importance of swept wings, and their use?

Q2: Why would swept wings be important for low speed airplanes?

Q3: Draw a swept wing with their important nomenclatures.

Q4: Draw some kinds of delta wings.

Q5: This is a plane carrier:

Why its wings are straight? Why not delta?

Q6: (30%) For the two planes below: a- Concord, and b- Plane carrying tanks.

Compare between the two planes giving the reason for the difference in:

a- Wings kind.

b- Engine kind.

c- Pilot cabin design.

d- The complication in boundary layer control.

e- The angle of attack during landing.

f- Why both planes do not have winglets?

Good Luck

Ali Sh. Bagir

جمهورية العراق

وزارة التعليم العالي و البحث العلمي

جامعة الفرات الأوسط التقنية

الكلية التقنية الهندسية / النجف

قسم هندسة تقنيات الطيران

المرحلة الثانية

أسئلة الفصل الأول للعام الدراسي

٢٠١٥-٢٠١٦

شعبة ضمان الجودة و الأداء الجامعي

قسم الطيران
م/ ر

Ministry of Higher Education and Scientific Research
Foundation of Technical Education
Al-Furat Al-Awsat Technical University
Technical Engineering College / Najaf

Departments: Automotive Technical Engineering
& Aeronautical Technical Engineering
Stage: Second
Subject: Fluid Mechanics

The First Semester Exam Questions for the Academic Year 2015-2016
First Semester

Note: Answer All Questions.

Q1/A- An 8-ft-long tank open to the atmosphere initially contains 3-ft-high water. It is being towed by a truck on a level road. The truck driver applies the brakes and the water level at the front rises 0.5 ft above the initial level as shown in Fig. 1A. Determine the deceleration of the truck.(5 marks)

B- Define incompressible flow and incompressible fluid. Must the flow of a compressible fluid necessarily be treated as compressible? (5 marks)

Q2/A-All fluids in the Fig. 2A are at 20°C. If atmosphere pressure=101.33 kPa and the bottom pressure is 242 kPa absolute, what is the specific gravity of fluid X?
(Note at this temperature the specific weight for SAE 30 oil is 8720 N/m, water 9790 N/m^3,and mercury 133100 N/m^3.) (6 marks)

B- What is the no-slip condition? What causes it? (4 marks)

Q3/A- A 2-ft-thick block constructed of wood (SG =0.6) is submerged in oil (SG =0.8), and has a 2-ft-thick aluminum (specific weight =168 lb/ft^3) plate attached to the bottom as indicated in Fig. 3A. Determine completely the force required to hold the block in the position shown. Locate the force with respect to point A. (10 marks)

B- Define the following terms: (10 marks)

1. A fluid 2. Accuracy error 3. Specific gravity 4. Viscosity 5. Eulerian method

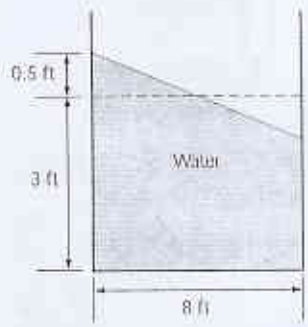


Fig. 1A

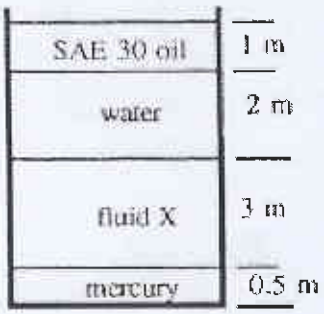


Fig. 2A

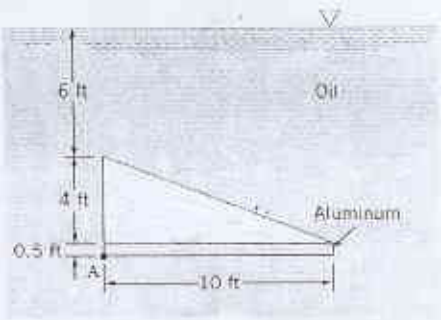


Fig. 3A

Q4/A- What is vapor pressure? How is it related to saturation pressure? (5 marks)

B- A 12-in.-diameter circular plate is placed over a fixed bottom plate with a 0.1-in. gap between the two plates filled with glycerin as shown in Fig. 4B. Determine the torque required to rotate the circular plate slowly at 2 rpm. Assume that the velocity distribution in the gap is linear and that the shear stress on the edge of the rotating plate is negligible. (10 marks)

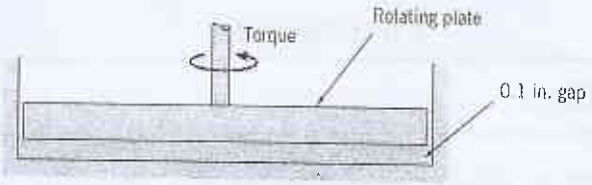


Fig. 4B

Q5/A- Define the resultant hydrostatic force acting on a submerged surface, and the center of pressure. (8 marks)

B-A velocity field is given by $V = x\hat{i} + x(x-1)(y+1)\hat{j}$, where u and v are in ft/s and x and y are in feet. Plot the streamline that passes through x=0 and y=0 . Compare this streamline with the streakline through the origin. (12 marks)

Q6/A-The homogeneous gate shown in Fig.6A consists of one quarter of a circular cylinder and is used to maintain a water depth of 4 m. That is, when the water depth exceeds 4 m, the gate opens slightly and lets the water flow under it. Determine the weight of the gate per meter of length. (15 marks)

B-The cylindrical tank with hemispherical ends shown in Fig. 6B contains a volatile liquid and its vapor. The liquid density is 800 kg/m ^{3}, and its vapor density is negligible. The pressure in the vapor is 120 kPa (abs), and the atmospheric pressure is 101 kPa (abs). Determine: (a) the gage pressure reading on the pressure gage; and (b) the height, h, of the mercury manometer, (take $\gamma_{Hg} = 133000\ \frac{N}{m^3}$). (10 marks)

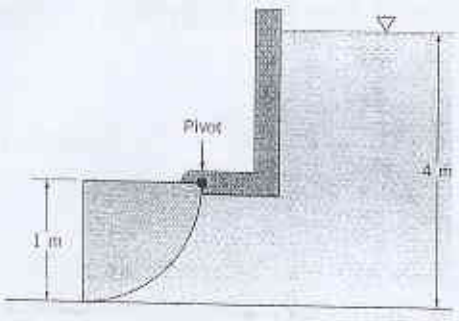


Fig. 6A

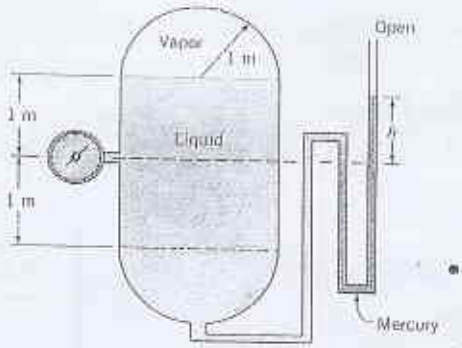
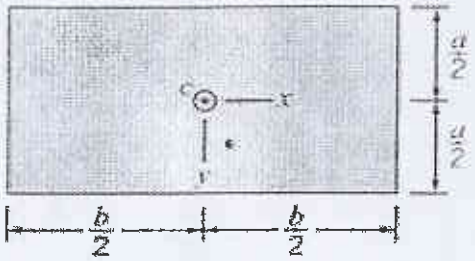


Fig. 6B

Good Luck

Lecturer
Dr. Dhafeer M. AL-Shamkhi

Head of Department
Dr. Hiader H.



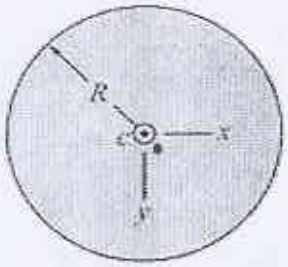
(a) Rectangle

$A = ba$

$I_{xx} = \frac{1}{12} ba^3$

$I_{yy} = \frac{1}{12} ab^3$

$I_{xy} = 0$

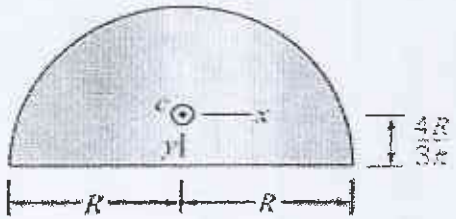


(b) Circle

$A = \pi R^2$

$I_{xx} = I_{yy} = \frac{\pi R^4}{4}$

$I_{xy} = 0$



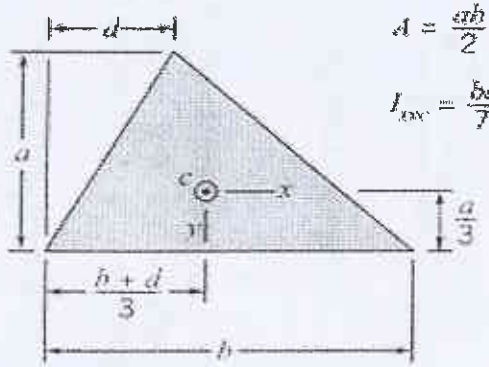
(c) Semicircle

$A = \frac{\pi R^2}{2}$

$I_{xx} = 0.1098R^4$

$I_{yy} = 0.3927R^4$

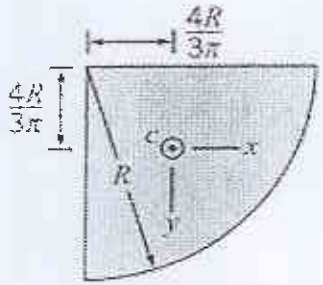
$I_{xy} = 0$



(d) Triangle

$A = \frac{ah}{2}$ $\quad I_{xx} = \frac{ba^3}{36}$

$I_{xy} = \frac{ba^2}{72}(b - 2d)$



(e) Quarter circle

$A = \frac{\pi R^2}{4}$

$I_{xx} = I_{yy} = 0.05488R^4$

$I_{xy} = -0.01647R^4$

FIGURE 2.18 Geometric properties of some common shapes.

قسم الطيران
ط/

ATU University
Technical College Engineering - Annajaf

Dep. : Automotive & Aeronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 2 hours.

****

Note: Endeavor All Questions Using prescribed tables

Group (A): Mechanics of Materials Conceptions (40 Marks)

Q1: Choose the appropriate answer (10 Marks)

(1) The stress concept relies on:

(A) Continuum elements. (B) Uniform distribution load. (C) Regulation body with applied load. (D) Irregulation body with applied load.

(2) Shear strain may be:

(A) Normal angle. (B) Inclined angle. (C) Radial deformation. (D) Small displacement.

(3) If we have a vertical-rigid bar, the useful analysis of load is:

(A) Whole body. (B) Divide body. (C) A&B. (D) Non all.

(4) Allowable stress of the body can be recognized by:

(A) Normal load. (B) Area. (C) Internal load. (D) External load.

(5) The distance between deflected area and less deflected area based on Saint-Venant's principles are:

(A) $\sigma_{Max} = 1.02\ \sigma_{Av}$. (B) $\sigma_{Max} \simeq 1.02\ \sigma_{Av}$. (C) $\sigma_{Max} \approx 1.05\ \sigma_{Av}$. (D) $\sigma_{Max} = 1.04\ \sigma_{Av}$.

Q2: Interpret the following cases: (10 Marks)

(1) Normal load on cross-sectional area.

(2) Tangential load on cross-sectional area.

(3) Strain gauge normal to dummy resistance.

(4) 0.2% true strain.

(5) Necking ratio (R/a).

****

Q3: What is the effect of the following states? (20 Marks)

(1) $\sigma_{Allow} = \sigma_{Fail}$.

(2) Body stressed under proportion limit.

(3) K and n constants in deflected body.

(4) Error in reading of strain gauge.

(5) Lateral to longitudinal strains.

Group (B): Mechanics of Materials Problems (60 Marks)

Q1: The resilience of specimen shows in stress-strain diagram in figure (1) is (0.15915 ksi) and Young's modulus elasticity (127.32 ksi). It is having a length of (5 in) and diameter of (2 in) with approximated axial displacement (0.25 in). The tester-man adds plasticizers to polyvinyl chloride to reduce stiffness of it. Determine one of three types used to manufacture of it and limited axial load. (10 Marks)

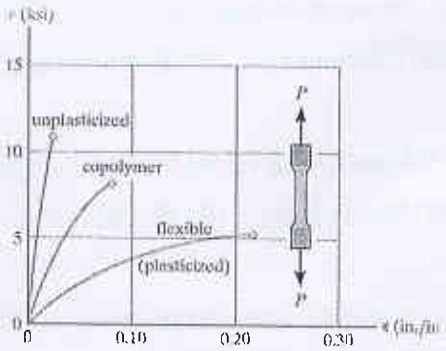


Figure (1) Specimen Testing

Q2: The figure (2) shows beam raised on three post made of (Ti-6Al-4V) and (6061-T6) respectively, The gap between the beam and (6061-T6) post is (0.18 mm) from the length of (Ti-6Al-4V) post . Fill the blank in the below tables, if the applied load on the beam is (400 kN): (40 Marks)

1- Statically condition:

N	Post alloy	Post Area (mm^2)	Reactions (kN)	Stress (MPa)
1	Ti-6Al-4V	500		
2	6061-T6	400		

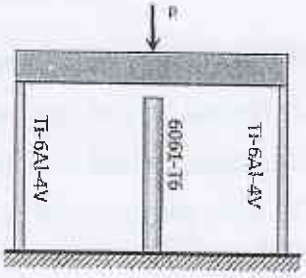


Figure (2) Three post raised beam

ATU University
Technical College Engineering - Annajaf

Dep. : Automotive & Aeronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 2 hours.

****

1- Thermal condition, If the increased temperature (85 °C):

N	Post alloy	Post Area (mm^2)	Reactions (kN)	Stress (MPa)
1	Ti-6Al-4V	500		
2	6061-T6	400		

Q3: Determine the maximum allowable torque **T** that can be transmitted by the joint as shown in figure (3). The shear pin **A** has a diameter of (25 mm) and it made from a material having a failure shear stress of (τ_{fail} = 150 MPa). Apply a factor of safety of 3 against failure. (10 Marks)

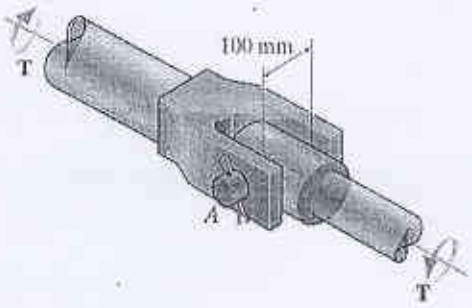


Figure (3) Join connected by pin

GOOD LUCK

Examiner
A.Lecturer: Mohammed A. Abass

Head of Aeronautical Dep.
A. Prof. Dr. Ali S. Baqir

Head of Automobile Dep.
Dr. Haider H. Al-Abdili

قسم الطيران
٢/ب

Ministry of Higher Education & Scientific Research
Al-Furat Al-Awsat Technical University
Najaf Engineering Technical College

004925

Aeronautical Eng. Tech. Department

Subject: Prog. II
Date:
Time: 2 hours
Class Level: 2st

Note// answer **four** questions only

Q1/ complete the following

1- ..... Used to plot a red dotted line.
2- $e^{-y/2\pi}$ in MATLAB written as .....
3- If a=[1 2 3], b=[4 5 6] then the division between them written as .....
4- The instruction A(1,:)=[] mean .....
5- If B= [5 8 6; 8 7 5; 1 2 0.5] then the sum of diagonal element instruction is .....

Q2/ Write a program in GUI using pop-up menu to display the degree of student according to the following:

A ⟶ ' Excellent'
A ⟶ ' Very Good'
A ⟶ ' Good'
A ⟶ ' Poor'

Q3/ write a program to find the square of all number less than 20 using "**while... end**" loop

Q4/ answer **two** of the following:

A- Write a program in GUI to find Z where:-

$z=\frac{a-3}{b^2}$ and a, b entering by user.

B- Write a program to enter any number and print status if (positive or negative or zero).

C- Write a program in GUI to enter three numbers and multiply them.

Q5/ write a program in MATLAB to plot the functions

$a=\cos(5t)-\sin(3t)+\frac{t^2}{(t+1)}$ in first location with color is blue.

$b=1.5\cos(x)+e^{(0.07x)}\sin(3x)$ in first location with color is green.

$c=\sin(x)$ draw discrete form in second location with color is black.

$d=e^{2x}+5e^{x}+6$ in third location with color is red with adding a plot title, axis labels and font size is 12.

In the interval $0\le x\le 2\pi$ and step is $(\pi/100)$ and $0\le t\le 5$ and step is (0.1) use the subplot command to display **Two dimension Graphics** to these functions on three windows on the same graph.

H. A. D.

Assist. Prof. Dr. Ali S. B.

Good Luck

004925

قسم الطيران
ط/ ٢

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
هيئة التعليم التقني
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية / نجف

القسم : هندسة تقنيات الطيران
المرحلة :الثانية
المادة:رياضيات /2
زمن الامتحان: ساعتان
التاريخ: / /2016

إمتحان الفصل الأول- العام الدراسي 2016/2015

Answer All Questions

Q1// Solve the following equations: (60)

a) $\frac{dy}{dx} = \frac{2x\,lnx + x}{\sin y + y\,\cos y}$

b) $(x\cos\frac{y}{x} + y\,\sin\frac{y}{x})\,y = x(\,y\,\sin\frac{y}{x} - x\,\cos\frac{y}{x})\frac{dy}{dx}$

c) $(3x^2\,y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$

d) $\frac{dy}{dx} - 3y = 6$

e) $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{-x} + e^{-2x} - x$

f) $\frac{d^4y}{dx^4} + 4\frac{d^3y}{dx^3} - 13\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 12y = 0$

Q2//a) Show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2\frac{\partial u}{\partial r}$, if $u = f(r,s), r = x + y, s = x - y.$ (10)

b) If $Z = \tan^{-1}\frac{x}{y}, x = u\cos v,\ y = u\sin v.$ Find $\frac{\partial z}{\partial u}$ and $\frac{\partial z}{\partial v}$ when u =1.3 and v $= \frac{\pi}{6}$. (10)

Q3//Find the derivative of the function $f(x,y) = 2xy - 3y^2$ at point $p_0(5,5)$ in the direction of $\vec{A} = 4i + 3j.$ (10)

Q4// Find the extreme value of the function $f(x,y,z) = 2x^2 + 3xy + 4y^2 - 5x + 2y.$ (10)

Good Luck

رئيس القسم
أ.م.د.علي شاكر

مدرس المادة
م.م.رسل عاشور

قسم الطيران
ط / ٢

وزارة التعليم العالي والبحث العلمي
جامعة الفرات الاوسط التقنية
الكلية التقنية الهندسية- نجف

القسم : قسم هندسة تقنيات الطيران
المرحلة :الثانية
المادة: Thermodynamic
وقت الامتحان: ساعتان
التاريخ: 2016/02/ 28

امتحان الفصل الاول للعام 2015-2016

Note: 1)Answer all the questions

2)Allow using tables

Q1/ *A tank has 1.6 m^3 in volume, is filled with air at a pressure of 5 bar and a temperature of 100°C. The air is then let off to the atmosphere through a valve. Assuming no heat transfer, determine the work obtainable by utilizing the kinetic energy of the discharge air to run a frictionless turbine.*

Take: Atmospheric pressure = 1 bar;

Cp for air = 1 kJ/kg K ;

Cv for air = 0.711 kJ/kg K. ***(30M)***

Q2/ *A steam power plant equipped with regenerative as well as reheat arrangement is supplied with steam to the H.P. turbine at 80 bar 470°C. For feed heating, a part of steam is extracted at 7 bar and remainder of the steam is reheated to 350°C in a re-heater and then expanded in L.P. turbine down to 0.035 bar. Determine:*

(i) Amount of steam bled-off for feed heating,

(ii) Amount of steam supplied to L.P. turbine,

(iii) Heat supplied in the boiler and reheater

(iv) Cycle efficiency, and

(v) Power developed by the system.

The steam supplied by the boiler is 50 kg/s. Draw the cycle in (h-s) and (T-s) plan. ***(30M)***

Q3/ *A constant-pressure piston/cylinder assembly contains 0.2 kg water as saturated vapor at 400 kPa. It is now cooled so that the water occupies half of the original volume. Find the heat transfer in the process.* ***(25M)***

Q4/ A) *What are Limitations of Carnot Cycle?* ***(8M)***

B) *How to improve the Rankine cycle efficiency?* ***(7M)***

Examiner

Basil Noori Merza

Head of department

Dr. Ali Shaker

....

Q1/(A)A master aluminum pattern is to be cast using a wooden pattern for hollow steel cylindrical piece with a flange of width 50 mm and diameter 245mm. The cylindrical portion is 195 mm long with an outer diameter 147mm and an inner diameter 70 mm . If the face of the flange is to be machined , design the wooden pattern ? (30 D)

(B) The extrusion ratio , die geometry , extrusion speed and billet temperature all affect the extrusion . Explain how and why , prove that? (10 D)

.....

Q2/(A) What are general considerations that product designers must keep when designing components out of plastics ?(10D)

(B) What are the functions of the screen pack and breaker plate at the die end of the extruded barrel ?(10D)

(c) Explain the difference between horizontal and vertical die casting machines. Which is the more popular? (10 D)

.....

Q3/(a)Discuss the effect of chemical composition and cooling rate on the structure and properties of cast irons . Briefly describe one method for producing (1) malleable iron . (2) nodular iron ?(10 D)

(b) Compare the Cu-Zn and Cu-Ni ranges of alloys from the following aspects where applicable : (1) suitability for hot and cold working , (2) effect the additional alloying elements, (3) susceptibility to , and effect of , heat treatment ,(4) typical compositions and uses ? (10 D)

(c) Which types of alloy can be hardened (1) by cold working , (2) by precipitation hardening , (3) by combination of (1) and (2) ? Why it is necessary to exercise close control of heat treatment variables in precipitation hardening heat treatment?(10 D)

.....

قسم الطيران
٢/ب

Ministry of higher education and scientific research
Al-Furat Al-Awsat Technical University

Technical college/Najaf

The first exam _ 2015-2016

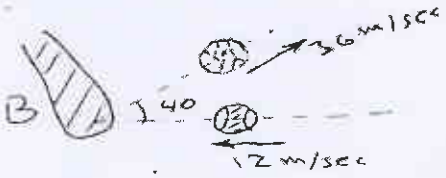
Aeronautical tech.Dep.
Time:2h
2nd class
Sub: mechanics II

Note 1 – (20 deg. each question)

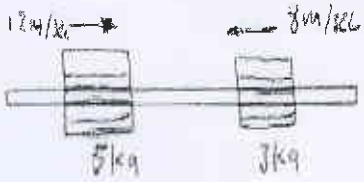
2- to answer all questions

Q1/ A projectile is fired with an initial velocity of 800 m/sec at a target (B) located (2000m) above gun (A) and at a horizontal distance of (12000m). Determine the value of the firing angle α .

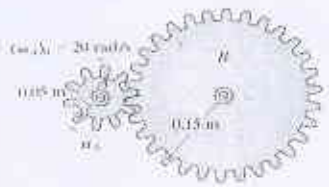
Q2/ A 2-N baseball is thrown with a velocity of 12 m/sec toward a batter . After the ball is hit by the bat (B) it has a velocity of 36 m/sec . in the direction shown in fig. if the ball and the bat are in contact 0.025 sec . determine the average impulsive force exerted by the bat on the ball during the impact



Q3/the coefficient of restitution between the two collars is known to be 0.75 determine (a) their velocities after impact (b) the energy losses during impact



Q 4/Gear A is given an angular acceleration $\alpha_A = 4t^3$ rad/s^2, where t is in seconds, and $(\omega_A)_0 = 20$ rad/s. find The angular velocity and angular displacement of gear B when t=2s



Q 5/ a car engine is idling at 500 rpm. When the light turns green .the crankshaft rotation speeds up at a constant rate to 2500 rpm over an interval of 3.0 s .how many revolutions does the crankshaft make during these 3.0 s.

Head of Department

Examiner

قسم الطيران
ط/

المرحلة: الثانية المادة: نظرية طيران الزمن: ساعتان الممتحن: د. وسام احمد عبد الواحد		وزارة التعليم العالي و البحث العلمي جامعة الفرات الاوسط التقنية الكلية التقنية النجف قسم هندسة الطيران

Attempt all questions.

All questions have equal marks

Q1: A small airplane of 500 kg climbing steadily with a thrust of 150kN, the lift force is equal to 20000 N, and the drag is equal to 200,000N, Find the angle of steady climb.

Q2: Explain the behavior of lift forces as the angle of attack increase, and why?

Q3: Explain the change of drag coefficient with Mach number.

Q4: Draw an airfoil with the main nomenclatures on it.

Q5: An airfoil of 150 cm chord. The maximum camber is 4.5 cm, the location of that maximum camber is 60 cm from the leading edge, and the maximum thickness is 19.5 cm. What is the NACA code of that wing based on four-digit airfoil.

Q6: Explain the important of delta wings for plains with low speeds.

Q7: Describe the control of boundary layer control by wing suction for a plane with low speed steady horizontal flight.

Good Luck

وسام احمد عبد الواحد
محرر المادة

وزارة التعليم العالي والبحث العلمي
جامعة الفرات الاوسط التقنيـــــة
الكلية التقنية الهندسيـــــة/ نجف

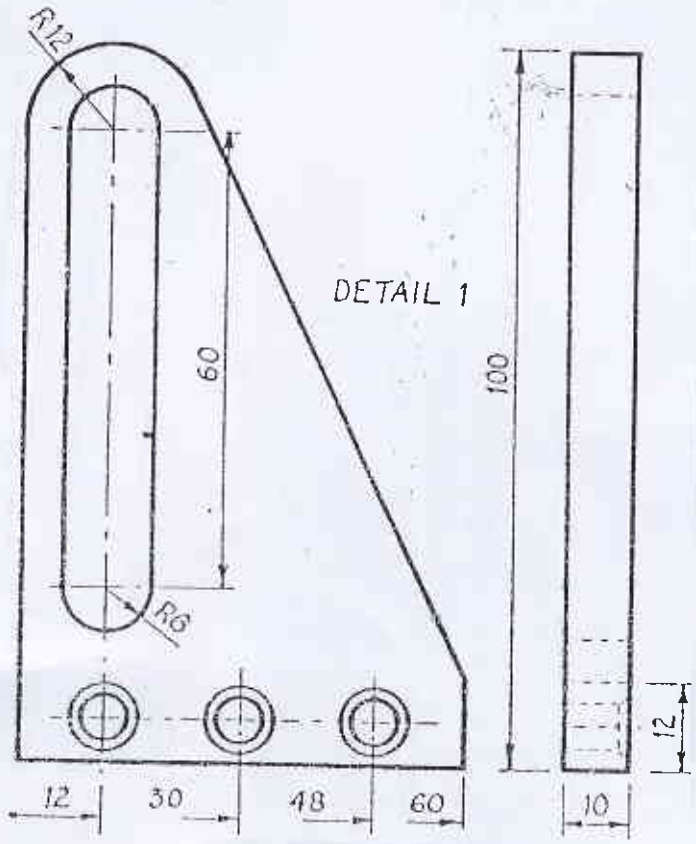
قسم هندسة تقنيات السيارات والطيران
الرسم الميكانيكي/ المرحلة الثانيـــة
الوقت/ ساعتـــــــــــــان

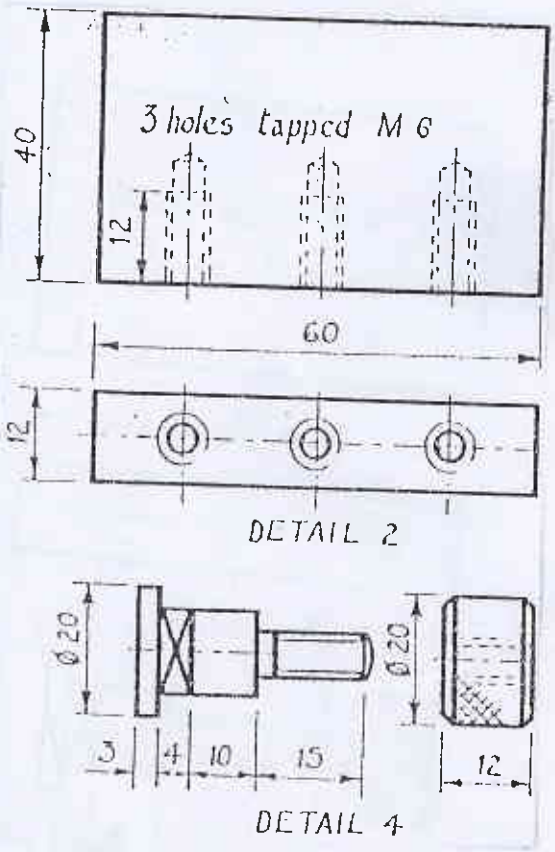
قسم الطيران
ط/1

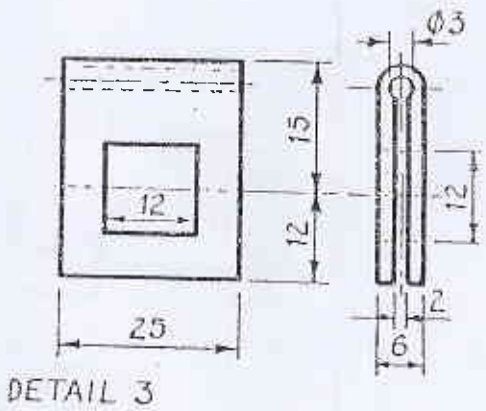
Q1/ For the assembly, draw the following:

A) Front View

B) Side View







Lecturer

Head of Department