الفرقة الثانية

تقارير فنية

ترم أول

Faculty of Engineering - Mataria		1st √	Semester
Department: Mechanical Power Engineering		2nd	Academic Year 2015/2016
Course Name: Technical Writing		Exam Type (Mid/Term): Term	
		Date of Exam: 9/1/2016	
Course Code: HM 2216	HELWAN	Time Allowed: 2 Hour	
Level: 2nd Year	UNIVERSITY	Maximum Mark : 60 Marks	
		Exam Pages: 2	

Attempt to Answer the following Questions:

Question (1): [15 Marks]

1- State the main guidelines that must be followed when writing a Business letter.

2- Write a business letter to the academic registrar of the American university in Cairo to enquire about the postgraduate programs in the mechanical engineering department. Your enquiry should include all the necessary details that will help you in selecting the appropriate program and apply for admission.

Question (2): [20 Marks]

1- Classify the main types of technical reports.

2- State the main use and/or examples of each type.

3- State the advantages of the inclusion of appendices in a technical report, and hence:

(a) Give different examples of the contents that may be included in appendices.

(b) Show how they are numbered and referenced within the text of the report.

4- State the different categories of ranking reference materials; giving examples for each category and the criteria for each rank.

Question (3): [15 Marks]

1- State the abbreviations of the following:

(a) take notice	(b) coefficient	(c) editor
(d) megapascals	(e) for example	(f) and others
(g) pages	(h) that is to say	(i) radian
(j) extra and so forth		

2- Write the following in numbers and units:

(a) six and half million American dollars

(b) ten kilo newtons

(c) five gigalitres

(d) sixty nine tonne per hour

(e) four thousands revolutions per minute

(f) ten millipascals

3- Rewrite the following references in the correct form in accordance of the alphabetical order method:

- Race Car Aerodynamics: Designing for Speed. Bentley Publishers, 1995. Katz, Joseph, Fifth edition
- Reza, N. J., John N. Andrew, M.M. Yousef, Vehicle dynamics: theory and applications, volume 1, number 4, J. vehicle dynamic, (2005)
- Automobile Engineering. McGraw-Hill, 2009, k.k. Jain, Athena, R.B. 2012, sixth edition, pages 210-230.

Question (4): [20 Marks]

The following represent the experimental data being obtained on a Petrol Engine Test stand. The Engine is 4 Cylinders, stroke volume = 1500 cc and compression ratio = 9:1. The measured data are obtained at full load.

Engine Speed, rpm:

800 – 1000 - 1250 – 1400 – 1600 – 1800 – 2100

Engine Brake Power, kW:

70 – 130 – 176 – 195 – 210 – 220 - 230

Engine Torque, Nm:

835 – 1241 – 1340 – 1330 – 1253 – 1067 – 1045

Fuel consumption, kg/hr:

0.15 - 0.27 - 0.35 - 0.38 - 0.42 - 0.45 - 0.48

Specific Fuel Consumption, g/kW.hr:

215 – 207 – 199 – 195 – 200 – 205 – 210

1. Put the above data in a Table
2. Write down the Title of the Table
3. Present in a Single graph - using appropriate drawing scales and symbols - the above given data; with the horizontal axis representing the engine speed.
4. Write down a suitable title of the graph.
5. Write in your own words a paragraph to explain the shown graphs.
6. Give Symbols to the both the engine data and the above measured data; and hence write a list of the Nomenclature.
7. Using the chosen symbols, formulate and write the following equations which is placed in chapter 3 of the report:

Engine Brake Power = (2 π / 60) x Engine Torque x Engine Speed

الفرقة الثانية

(الترم الأول ٢٠١٦)

ديناميكا حرارية (2)

م.م

Faculty of Engineering
Mataria - Helowan University
Mechanical Engineering Department

Year: 2nd
Time : Three hours
Final Exame Jan2016

Thermodynamics(2) (90 marks)

General Notes:

Answer the Following Questions
Assume any necessary assumptions
Thermodynamic Tables are allowed

Answer the following questions

Question 1. (15Points)

1 -At the beginning of the compression process of an air-standard dual cycle with a compression ratio of 16, the temperature is 300 K and the pressure is 0.097 MPa and the volume is $0.084 m^3$. The maximum pressure of the cycle is 6.0 MPa and the maximum temperature is $1320^\circ C$. Determine (a) the thermal efficiency and (b) the mean effective pressure if Cp = 1.006kJ/kg.K and Cv = 0.717kJ/kg.K

Question 2. (15Points)

Air enters the compressor of an Regenerative Reheat Brayton cycle at 100 kPa, 300K, with a volumetric flow rate of $5 m^3/s$. The compressor pressure ratio is 8. The turbine inlet temperature is 1300K. If a regenerator with an effectiveness of 80% is incorporated in the cycle. Determine: (a) the thermal efficiency of the cycle, (b) the back work ratio, (c) the net power developed, in kW.

Question 3. (15Points)

Power plant operates on the basis of the combined cycle. The gas-turbine cycle in a combined gas steam cycle has a pressure ratio of 8. Air enters a compressor at 1 bar and 27^oC. The exhaust gas enters the turbine at 1227^oC. The bottoming cycle is a simple Rankine Cycle for which the turbine – inlet conditions are 7 MPa and 500^oC. The steam leaves the turbine at 5 kPa. The exhaust gases leave the heat recovery boiler at 177^oC. If the net power developed is 500MW. Detrmine the thermal efficiency.

Question 4. (15Points)

In an Ideal Reheat Rankine Cycle the steam enters the high pressure turbine (HP) at pressure of 3MPa and temperature of $300^\circ C$. The steam expands to 300kPa. The steam is then reheated to the $300^\circ C$ and then enters the low pressure turbine. The steam is then expands to the condenser pressure of 10kPa. Determine the thermal efficiency of the cycle.

Question 5. (15Points)

A refrigerator uses refrigerant R12 as the working fluid and operates on an actual vapor compression refrigeration cycle between an evaporator temperature of -20^oC and a condenser pressure of 0.9 MPa. If the compressor isentropic efficiency is 85% , the superheating effect degrees is $10\ ^\circ C$ and the mass flow rate of refrigerant is 180 kg/sec. Calculate the COP and the effective displacement in m^3/s.

Question 6. (15Points)

Methane and air reacted according to the balanced equation:-

$$CH_4 + 2.409\lfloor O_2 + 3.774 N_2 \rfloor = CO_2 + 0.409 O_2 + 9.09 N_2 + 2H_2O$$

If the pressure is 1 atm, and the reactance and products temperatures are 350K and 500K respectively. Determine the excess air percentage and the heat of combustion.

Examining committee:
Name: Dr I. G. EL-GIZAWY
Signature: : Dr I. G. EL-GIZAWY

الفرقة الثانية
(الترم الأول ٢٠١٦)

ميكانيكا الموائع (٢)
ق.م

Helwan University
Faculty of Engineering-Mattaria
Mechanical Power Engineering Department
Second Year Students

Fluid Mechanics-2
Final-Term Exam
3rd January 2016
Time Allowed: 3 hours

Answer the following TWO questions from the right side of the answer booklet and the rest of the exam from the left side.

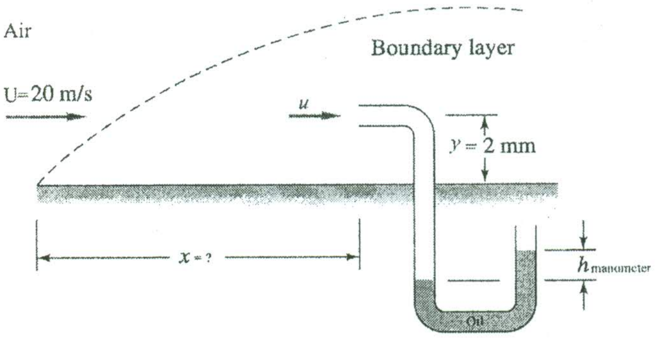
» Read the question carefully » Write neatly with a **pen** and sketch with a pencil.

Question 1 (25 points)

(a) Explain **with sketch only**, the effect of the pressure gradient on the velocity profile, $u(y)$, $\frac{\partial u}{\partial y}$ and $\frac{\partial^2 u}{\partial y^2}$ in flow over a surface with favorable and adverse pressure gradient. (5 points)

(b) Air at 20°C and 1 atm $\left(\rho_{air} = 1.2\ kg/m^3,\ \mu = 1.8\times10^{-5}\ kg/m.s\right)$ flows at $U = 20\ m/s$ past a flat plate. A pitot stagnation tube, placed at $y = 2$ mm from the wall, develops a manometer head $h_{manometer} = 16$ mm of oil with $\rho_{oil} = 825\ kg/m^3$. (i) Use the **Blasius solution** velocity profile for laminar flow (listed in the following table) to estimate the downstream position x of the pitot tube. (ii) Estimate $\delta, \delta^*, \theta, C_{fx}$ and the shear stress at the position of the pitot tube (using the Blasius solution relations that you already memorize). Assume the flow remains laminar up to $Re_x = 3\times10^6$. (10 points)

Hint: $\Delta p_{manometer} = (\rho_{oil} - \rho_{air})\ g\ h_{manometer}$ where $g = 9.81\ m/s^2$. $u = \sqrt{2\Delta p_{manometer}/\rho_{air}}$



$\eta = y\left(\frac{U}{\nu x}\right)^{1/2}$	$\frac{u}{U}$	$\eta = y\left(\frac{U}{\nu x}\right)^{1/2}$	$\frac{u}{U}$
0	0	2.6	0.77246
0.2	0.06641	2.8	0.81152
0.4	0.13277	3.0	0.84605
0.6	0.19894	3.2	0.87609
0.8	0.26471	3.4	0.90177
1.0	0.32979	3.6	0.92333
1.2	0.39378	3.8	0.94112
1.4	0.45627	4.0	0.95552
1.6	0.51676	4.2	0.96696
1.8	0.57477	4.4	0.97587
2.0	0.62977	4.6	0.98269
2.2	0.68132	4.8	0.98779
2.4	0.72899	5.0	0.99155
		∞	1.0

(c) Consider that the velocity distribution in the **laminar boundary layer** of a flat plate is given by $\frac{u}{U} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^3$ where U, is the free stream velocity. Find expressions for δ, δ^* and θ using the von Karman momentum integral equation. Estimate the value of the shape factor, H. (10 points)

Question 2 (20 points)

(a) **Explain briefly with simple sketches**, what is meant by
(i) **NACA2412**,
(ii) **Magnus effect** on a spinning ball. (5 points)

(b) **Sketch** the variation of the lift coefficient with the angle of attack for **symmetrical and non symmetrical airfoils**. Indicate the stall points. (5 points)

(c) A race car uses an **inverted NACA0012 airfoil** to provide down thrust on its rear wheels. The airfoil has two end plates so the flow is assumed to be two-dimensional. The airfoil is 2m long and has a chord of 1m. (i) Find the angle of attack, α to produce a downward thrust of 100 N at a car speed of 100 km/h. The lift coefficient and the drag coefficient are given by $C_L = 2\ \pi\alpha$ and $C_D = 0.01 + 0.5\ \alpha^2$, where α in radians. (ii) What is the extra power required to overcome the airfoil drag? (iii) What is the circulation around the airfoil by potential flow and the airfoil produced the same thrust under the same condition? Assume $\rho_{air} = 1.2\ kg/m^3$. (10 points)

Best Wishes
Dr. Eng. Khairy Elsayed

Continue with the rest of the questions on the second paper of the exam.

University of Helwan ***Faculty of Engineering, Mattaria*** ***Second Year Mech. Power Engineering***	***Sunday*** ***01-02-2016***	***Final Term Exam*** ***Fluid Mechanics II*** ***Time Allowed: One and half Hour***

Any missed data can be assumed

Please Answer the following questions

3.a) The velocity component of two-dimensional flow of incompressible fluid is given by

$$u = U + \frac{Ax}{x^2 + y^2} \quad \text{and} \quad v = \frac{Ay}{x^2 + y^2}$$

Does this field satisfy continuity for incompressible flow? Find the position of the single stagnation point, where v = 0. (5 points)

3.b.) The stream function for a certain flow is

$$\psi = 4\, r \cos\theta - r \sin\theta$$

(a) Determine the velocity components.
(b) Find the potential function.
(c) Is the flow irrotational? (10 points)

4.a) An incompressible velocity field is given by

$u = a(x^2 - y^2)$, v = unknown, and $w = b$ where a and b are constants.

What must the form of the velocity component v be? (3 points)

4.b.) Take the velocity field of part (*i.*) with $b = 0$ and $v = -2axy$, namely,

$$u = a(x^2 - y^2), \quad v = -2axy, \text{ and } \quad w = 0.$$

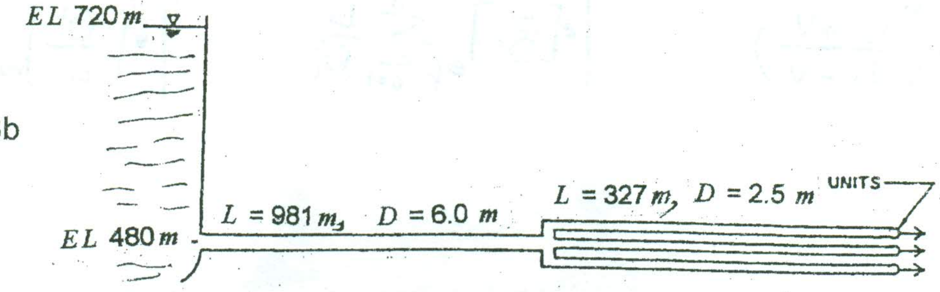
Determine under what condition it is a solution to the Navier-Stokes Momentum equation. Assuming that these conditions are met, determine the resulting pressure distribution when z is "up", namely; ($g_x = 0$, $g_y = 0$, and $g_z = -g$). (12 points)

5.a) Use the rigid water column theory to prove that the time necessary to accelerate the flow to given the velocity

$$t = \frac{LV_0}{2gH_0} \ln \frac{V_0 + V}{V_0 - V}$$ (6 points)

5.b) A 3-unit pumped storage facility is operating in the generating mode. During emergency shut-down, the wicket gates on the turbines are closed in such a manner that the velocities in the penstocks at the turbines decrease linearly from 25 m/s to zero in 45 $sec.$ Compute the maximum pressure head at the wicket gates during shut-down. Assume f-values are the same for all pipes (f = .02.). (See Fig. P3b). (9 Points)

Fig. P3b



With all of my best wishes

Dr. Arafah E. Ghoneimy

Flow	ψ	ϕ	Velocity Components
Uniform	$U(y\cos\alpha - x\sin\alpha)$	$U(x\cos\alpha + y\sin\alpha)$	$u = U\cos\alpha$, $v = U\sin\alpha$
Source & Sink	$\frac{m}{2\pi}\theta$ $\frac{-m}{2\pi}\theta$	$\frac{m}{2\pi}\ln(r)$ $\frac{-m}{2\pi}\ln(r)$	$V_r = \frac{m}{2\pi r}$, $V_\theta = 0$ $V_r = \frac{-m}{2\pi r}$, $V_\theta = 0$
Free Vortex	$-k\ln(r) = \frac{\Gamma}{2\pi}\ln(r)$	$k\theta = \frac{\Gamma}{2\pi}\theta$	$V_r = 0$, $V_\theta = \frac{k}{r}$, $\boxed{k = \frac{\Gamma}{2\pi}}$
Source + Sink	$\frac{-kr\sin\theta}{r^2 - a^2}$	$\frac{kr\cos\theta}{r^2 - a^2}$	$V_r = \frac{-k\cos\theta}{r^2 - a^2}$, $V_\theta = \frac{-k\sin\theta}{r^2 - a^2}$ $\boxed{k = \frac{ma}{\pi}}$
Doublet	$\frac{-k\sin\theta}{r}$	$\frac{k\cos\theta}{r}$	$V_r = \frac{-k\cos\theta}{r^2}$, $V_\theta = \frac{-k\sin\theta}{r^2}$
Uniform + Source "half body"	$Ur\sin\theta + \frac{m}{2\pi}\theta$ $\psi_{surface} = \psi_{stag} = \frac{m}{2}$	$Ur\cos\theta + \frac{m}{2\pi}\ln(r)$	$V_r = U\cos\theta + \frac{m}{2\pi r}$, $V_\theta = -U\sin\theta$ $b = \frac{m}{2\pi U}$, $r = \frac{b(\pi - \theta)}{\sin\theta}$, $y = b(\pi - \theta)$ thickness $\Rightarrow y_{max} = \pi b$
Uniform + Source + Sink "Rankine Oval"	$Ur\sin\theta - \frac{kr\sin\theta}{r^2 - a^2}$ $\psi_{surf} = \psi_{stag} = 0$	$Ur\cos\theta + \frac{kr\cos\theta}{r^2 - a^2}$	$V_r = U\cos\theta - \frac{k\cos\theta}{r^2 - a^2}$, $V_\theta = -U\sin\theta - \frac{k\sin\theta}{r^2 - a^2}$ $h = \sqrt{\frac{k}{U} + a^2}$, length $= 2b$
Uniform + Doublet "cylinder"	$Ur\sin\theta - \frac{k\sin\theta}{r}$ $\psi_{sur} = \psi_{stag} = 0$ $\psi = Ur\sin\theta\left(1 - \frac{b^2}{r^2}\right)$	$Ur\cos\theta + \frac{k\cos\theta}{r}$ $\phi = Ur\cos\theta\left(1 + \frac{b^2}{r^2}\right)$	$V_r = U\cos\theta - \frac{k\cos\theta}{r^2}$, $V_\theta = -U\sin\theta - \frac{k\sin\theta}{r^2}$ $b = \sqrt{\frac{k}{U}} = r_{stag.}$ $V_r = U\cos\theta\left(1 - \frac{b^2}{r^2}\right)$, $V_\theta = -U\sin\theta\left(1 + \frac{b^2}{r^2}\right)$ @ $r=b$: $V_{rs} = 0$, $V_\theta = -2U\sin\theta$
Uniform + Doublet + Free Vortex	$Ur\sin\theta - \frac{k\sin\theta}{r} - \frac{\Gamma}{2\pi}\ln(r)$ or $Ur\sin\theta\left(1 - \frac{b^2}{r^2}\right) - \frac{\Gamma}{2\pi}\ln(r)$	$Ur\cos\theta + \frac{k\cos\theta}{r} + \frac{\Gamma}{2\pi}\theta$ or $Ur\cos\theta\left(1 + \frac{b^2}{r^2}\right) + \frac{\Gamma}{2\pi}\theta$	$b = \sqrt{\frac{k}{U}}$, $V_r = U\cos\theta - \frac{k\cos\theta}{r^2} = U\cos\theta\left(1 - \frac{b^2}{r^2}\right)$ $V_\theta = -U\sin\theta - \frac{k\sin\theta}{r^2} - \frac{\Gamma}{2\pi r} = -U\sin\theta\left(1 + \frac{b^2}{r^2}\right) - \frac{\Gamma}{2\pi r}$ @stagnation $\sin\theta = \frac{\Gamma}{4\pi U b}$

* $h_f = \frac{fLV^2}{2g}$
* $\frac{P_1}{\gamma} - \frac{P_2}{\gamma} - \frac{fL}{2gD}$ * $V^2 = \frac{L}{g}\frac{dV}{dt}$
* $t = \frac{LV_0}{2g\,H_0}\ln\left(\frac{V_0 + V}{V_0 - V}\right)$

Series Pipes:

- $\left[\frac{fL}{D^5}\right]_{eq} = \sum_{i=1}^{n}\frac{f_i L_i}{D_i^5}$
- $\left[\frac{L}{D^2}\right]_{eq} = \sum_{i=1}^{n}\frac{L_i}{D_i^2}$

Parallel Pipes:

- $\left[\frac{D^5}{fL}\right]_{eq}^{1/2} = \sum_{i=1}^{n}\left[\frac{D_i^5}{f_i L_i}\right]^{1/2}$
- $\left[\frac{D^2}{L}\right]_{eq} = \sum_{i=1}^{n}\left[\frac{D_i^2}{L_i}\right]$

الفرقه الثانيه (ترم أول ٢٠١٦)

تحليل عددي

م.م

HELWAN UNIVERSITY FACULTY OF ENGINEERING. SECOND YEAR MECH. POWER ENG	*Wednesday* *01-06-2016*	FINAL TERM EXAM NUMERICAL ANALYSIS TIME ALLOWED: 3 HOURS

Please Answer the following questions

* Any missed data can be assumed — *Maximum points 70*

1.) Use the Newton-Raphson Method to get the root of the equation:

$$f(x) = -2.1 + 6.21x - 3.9x^2 + 0.667x^3$$ to within error 0.01 percent.

2.) Use Gauss-Seidel method to obtain the solution of the following system of equations:

$$x_1 - 3x_2 + 12x_3 = 10$$
$$5x_1 - 12x_2 - 0.3x_3 = -33$$
$$x_1 - 14x_2 + 10x_3 = -103$$

3.) Beginning with (0, 0, 0), use the relaxation to solve the system:

$$6x_1 - 3x_3 + 10x_3 = 11$$
$$2x_1 + x_3 - 8x_3 = -15$$
$$6x_1 - 7x_3 + x_3 = 10$$

4.) Use Euler's method with $h = 0.5$ and 0.25 to solve the initial value problem over the interval $x = 0$ to $x = 2$:

$$\frac{dy}{dx} = yx^2 - y \text{ where } y(0) = 1.$$

5.) Evaluate the integral of the following tabular data using the trapezoidal rule:

x	0	0.1	0.2	0.3	0.4	0.5
$f(x)$	1	7	4	3	5	9

6.) What degree of polynomial is required to fit exactly to all six data points? What lesser-degree polynomial will nearly fit the data? Justify your answer.

7.) Evaluate the integral

$$\int_0^{\pi} (4 + 2\sin x)\, dx$$

a.) By Simpson's $\frac{1}{3}$ *Rule*

b.) By Simpson's $\frac{3}{8}$ *Rule*

With All My Best Wishes and Have a Good Luck
Dr. Arafah E. Ghoneimy

الفرقة الثانية
دور يناير ٢٠١٦

نظرية آلات
م.م

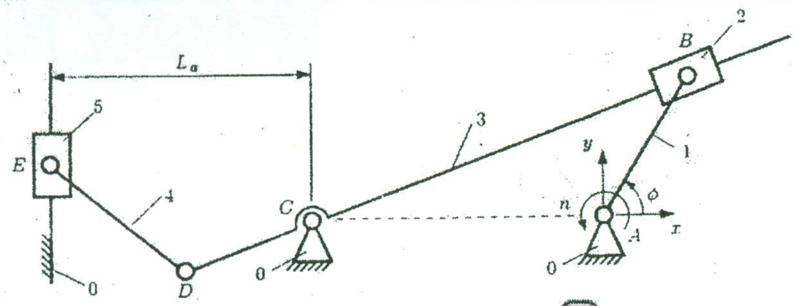
Faculty of Engineering - Mataria	Semester : First Semester
Department of Mech. Design	Academic Year : 2015/2016
Corse Title : Theory of Machines For Mechanical Power Students	Exam Type : Final Exam
	Date of Exam : Jan. 2016
Corse Code : HT 2113	Time Allowed : 3 Hours
Year :Second Year	Maximum Mark : (90)

HELWAN UNIVERSITY

Answer the following questions:

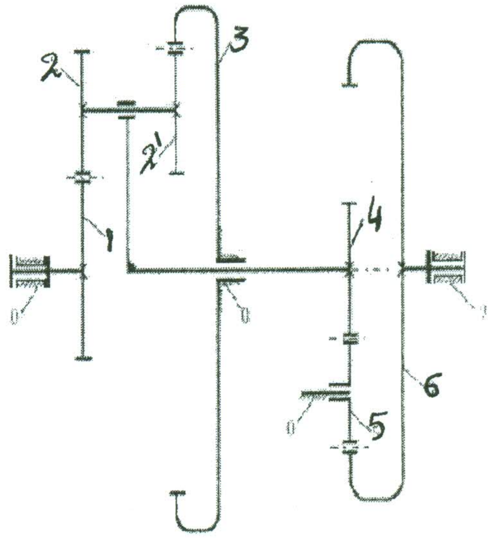
Question One (30 Mark):

The shown mechanism is drawn by scale 1:1. Determine the number of degrees of freedom , the linear velocity of the slider link E and the angular acceleration of link 3 if the crank AB rotates **c.c.w** at ω_1 = 2 rad/s.



Question Two (15 Mark):

A planetary gear train is shown in the figure. The sun gear 1 has N1 = 11 teeth, the planet gear 2 has N2 = 19 teeth, gear 3 has N3 = 40 internal gear teeth, gear 4 has N4 = 29 external gear teeth, and gear 5 has N5 = 24 external gear teeth. Gear 1 rotates with a constant input angular speed n1 = 200 rpm and gear 3 is fixed. All gears have the same module. Find the angular velocity of the output ring gear 6 (ω_6).



Question There (15 Mark):

Draw the profile of the cam when the roller reciprocating radial follower moves with cycloidal motion during out stroke and return stroke, as given below

* Out stroke with maximum displacement of 30 mm during 180° of cam rotation,

* Return stroke for the next 150° of cam rotation,

* Dwell for the remaining 30° of cam rotation.

The minimum radius of the cam is 30 mm and the roller radius of the follower is 10 mm.

Question Four (20 Mark):

The circular cam of radius 0.15 m rotates with the average angular velocity ω_{av} = 300 s^{-1}. The follower 3 of mass m = 0.4 kg is acted upon by the driving force F such that F = 2000 N for 0 < φ < π and F = 200 N for π < φ < 2 π .

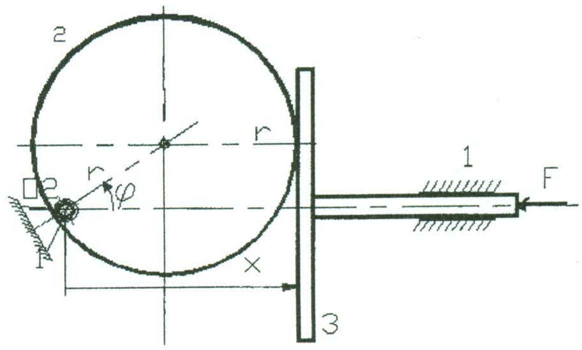
a. Obtain $x, \dot{x}$ and $\ddot{x}$ as function of φ.

b. Obtain M_D as function of φ, hence obtain M_{av}.

c. Obtain S as function of φ, hence obtain M_{se}.

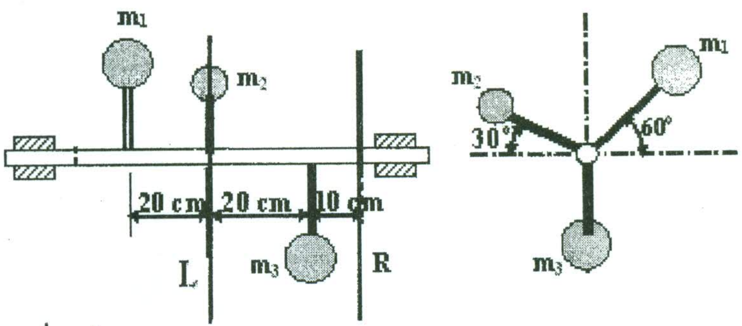
d. Obtain Δw_{max} considering approximate values of φ_{min} and φ_{max} as π/4 and π respectively.

e. Obtain the flywheel size I_O for speed fluctuation δ = 0.004.



Question Five (10 Mark):

The magnitude and the position of the unbalancing masses are shown in figure and indicated as m_1r_1=80, m_2r_2=60 and m_3r_3=40 gmcm . Find the mass and the location of the required balancing masses to be added at the given balancing planes **L** and **R**. Solve only analytically.



الفرقة الثانية
(ترم أول ٢٠١٦)

الكترونيات

Helwan University Faculty of Engineering at Mataria Mechanical Power Dept.	Academic level: **Second** Course code & title: Electronics Total mark: 70 marks Instructor: Dr. Hamdy Amin	**Final Exam Jan. 2016** First Term **Time allowed:** Three Hours	

Answer the following questions

1 **a) Sketch the atomic structure of silicon and insert an impurity of antimony (sb) (pentavalent)?**

b) Derive an equation for the current density in a silicon semiconductor?

2 **a) Describe in your own words the conditions established by forward- and reverse-bias conditions on a *p–n* junction diode and how the resulting current is affected.**

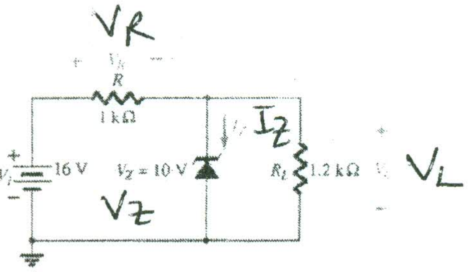
b) Determine the thermal voltage for a diode at a temperature of 20°C.

c) For the same diode of part (b), find the diode current if I_o = 40 nA, η = 2 (low value of V_D), and the applied bias voltage is 0.5 V.

3 **a) Sketch a circuit diagram for the bridge circuit showing the input and output signals?**

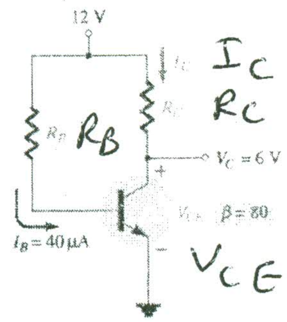
b) For the Zener diode network of the circuit below, determine V_L, V_R, I_Z, and P_Z.

c) Repeat part (b) with R_L = 3 kΩ.



4 **a) Explain the different operation modes of a Bipolar Junction Transistor (BJT)?**

b) Given transistor circuit in the following circuit, Determine I_C, R_C, R_B and V_{CE} (Assume transistor in Active mode)?



Property	Ge	Si
Atoms/cm³	4.4 × 10²²	5.0 × 10²²
n_i at 300°K, cm⁻³	2.5 × 10¹³	1.5 × 10¹⁰
μ_n, cm²/V-s at 300°K	3,800	1,300
μ_p, cm²/V-s at 300°K	1,800	500