



University of Technology
Department of Applied Sciences
Final Examination



Branch: Applied Physics
 Subject: Thermodynamic
 Examiner: Dr. Mukhlis M. Ismail

2016 -2017

Class : 2nd year
 Time : 3 hours
 Date :

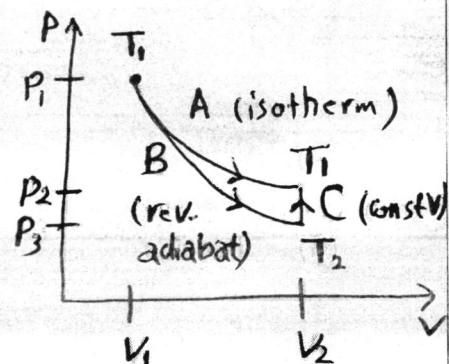
Note: Answer 5 questions only. (10 points for each question)

Q1/ Define the zero, first, second and third laws of thermodynamic.

Q2/ A) 1 mol of N₂(g) at 25.0 °C and a pressure of 1.0 bar undergoes an isothermal expansion to a pressure of 0.132 bar. Calculate the work done.

B) A particular engine has a power output of 5000 W and an efficiency of 25%. If the engine expels 8000 J of heat in each cycle, find: (a) the heat absorbed in each cycle and (b) the time for each cycle.

Q3/ Find ΔU, ΔH, q, w, and ΔS for a reversible ideal gas of curve A, B and C shown in figure, then prove that ΔU, ΔH, and ΔS are state function while q and w are not.



Q4/ Prove that: a) $\Delta S = C_p \ln(T_2/T_1) - R \ln(P_2/P_1)$ for an ideal gas

b) $\Delta A = \Delta U - T\Delta S$, c) $\epsilon = 1 - T_2/T_1$ for Carnot cycle of an ideal gas,

d) $\int dq_{rev}/T = 0$ for Carnot cycle of an ideal gas. e) $C_p = (\partial H/\partial T)_p$.

Q5/ A) A glass rod is heated and then blown by a glassblower. When it is at 185°C it is brought outside to cool. 3200 J of heat are transferred from the glass to the air, which is at 18°C. Find the change in entropy of the universe.

B) Using Joule free expansion to prove that the internal energy of an ideal gas depends only on temperature.

Q6/ A) Is the following reaction spontaneous? CO(NH₂)_{2(aq)} + H₂O_l → CO_{2(g)} + 2NH_{3(g)}, if you know ΔH=119kJ, ΔS=354.8 J/K and T=25°C.

B) The work output is 900 kJ and heat rejection is 150 kJ of Carnot heat engine. Find T_{Hot} if you know that T_{Cold}=27°C.



**University of Technology
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**Subject: Modern physics
Branch: Applied Physics
Examiner: Dr. Adi M. Abdul Hussien**

**Class: 2nd year
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Date: 7 / 6 /2017**

Note: Answer 4 questions only.

Q1) Explain with short answer, Then draw a diagram to illustrate it:-

- A)** - Pair production and annihilation.
- B)**- The Michelson-Morley Experiment.
- C)**- Laser system.

(17.5marks)

Q2) A) Number and then explain the most important applications of Doppler effect in the medical and industrial field. **(7.5 marks)**

B) A fire truck, with its siren on, is moving at 20 m.s^{-1} towards a burning building. A person standing next to the road with a detector, measures the frequency of the sound emitted by the siren to be 450 Hz. The measured frequency is higher than the frequency of the sound emitted by the siren.

1. Is the fire truck moving towards or away from the person? **(10marks)**
2. Explain why the registered frequency is higher?
3. Calculate the frequency of the siren.

Q3) A) How does the Compton effect differ from the photoelectric effect? **(7.5marks)**

B) In a Compton scattering , The scattered photon has an energy of 150KeV and the recoiling electron has a kinetic energy of 40KeV. Assume that before the scattering the electron is at rest.

- a) Find the wavelength in (nm).
- b) The energy in (KeV) of the incident photon. **(10marks)**
- c) Calculate the scattered angle.

Q4) A) Briefly describe the basic principle operation of X-ray tube ? Then sketch the basic components of it? **(7.5marks)**

B) Determine the wavelength of an electron accelerated by a 100V potential difference , find the velocity of that electron ? **(10marks)**



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Q5) A) what is the lifetime of a muons travelling at $0.6c$, if its rest lifetime is 2.2ms ?
(7.5marks)

B) How fast must a meter stick be moving if its length is observed to shrink to 0.5 m ?
(10marks)

Useful constants: Planck constant $h=6.6\times 10^{-34} \text{ J.S}$

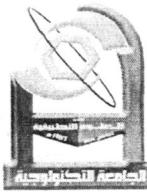
Electron rest mass $m_e=9.1\times 10^{-31} \text{ Kg}$

Electron charge $e=1.6\times 10^{-19} \text{ C}$

Speed of light $c=3\times 10^8 \text{ m/s}$

The speed of sound in air is 340 m.s^{-1}

Good luck



University of Technology
Department of Applied Sciences
1st term examination 2016/2017



Subject : Electrical circuits

Class : 2nd year

Branch : Applied physics

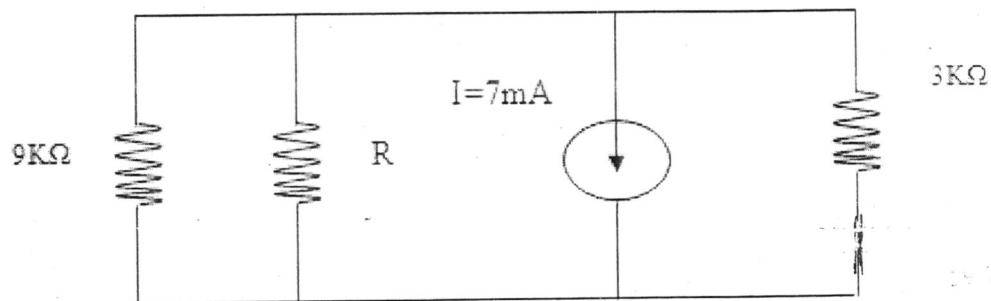
Time : 3 hours

Examiner: Dr. Wafaa Abdul khaliq

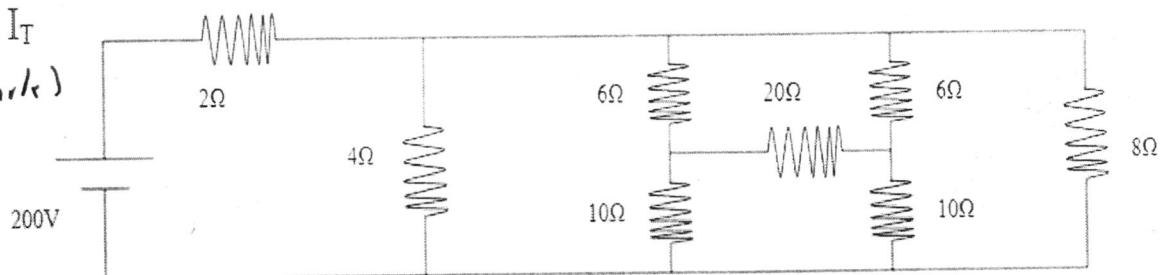
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ANSWER FOUR QUESTIONS ONLY

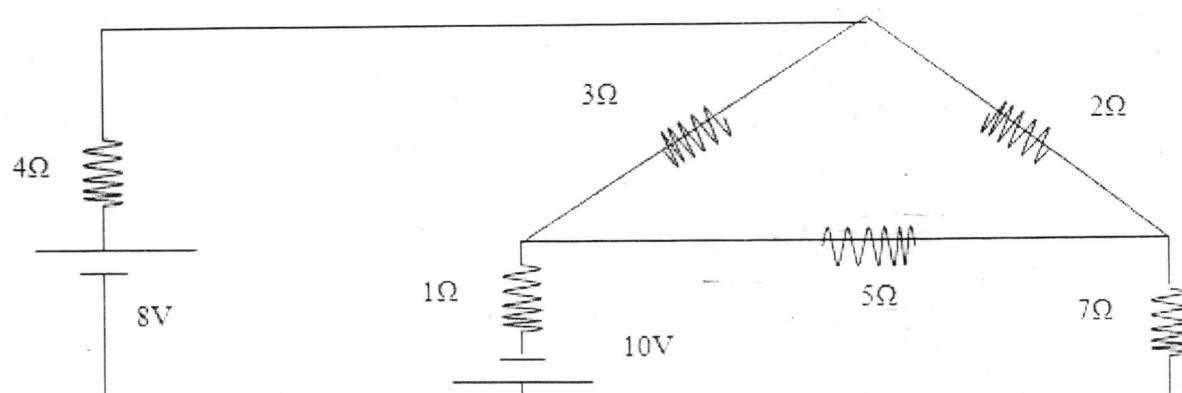
Q- 1 - Find the maximum power to R. (15 Mark)



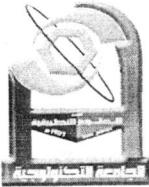
Q-2 Find I_T
(12.5 Marks)



Q.3-Using a Δ -Y or Y- Δ conversion, find the current through 4Ω (12.5 Mark)



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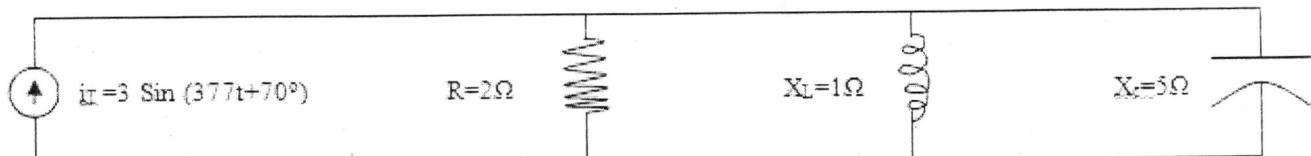
Q-4 A- Find the admittance (Y) of each parallel branch. (12.5 Mark)

B- Find the total admittance (Y_T) in polar form.

C- Draw the admittance diagram.

D- Find the value of L.

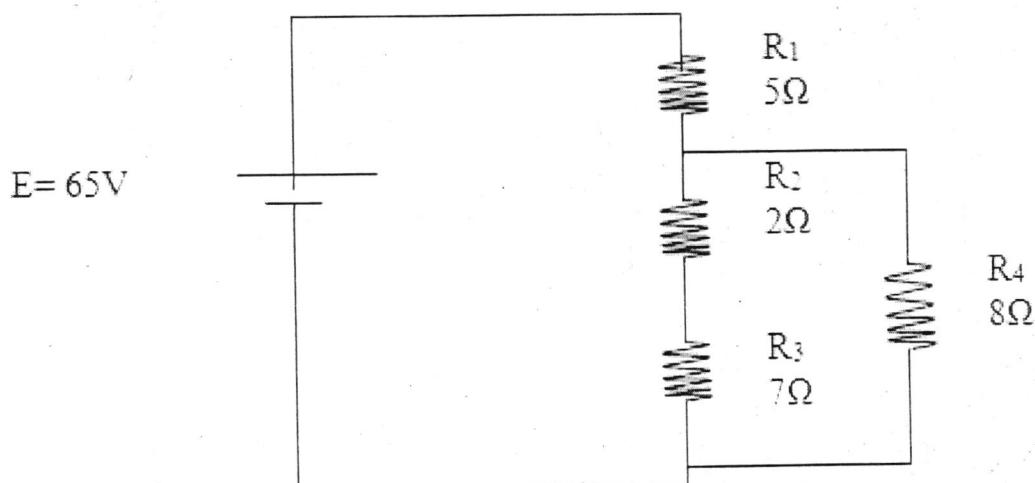
E- Find the voltage in phasor form.



Q-5A Find the phase relationship between the waveforms of the set

$$v = -5 \sin(wt + 30^\circ), i = 10 \sin(wt - 60^\circ). \quad (5 \text{ Mark})$$

Q-5B Determine L_4 for the circuit, by using the current divider rule. (7.5 M)



University of Technology
Department of Applied Sciences
Final Examination 2016/2017



Subject: Visual Basic
Branch : Physics
Examiner : L. Samaa Fuad

Class : 2nd year
Time : 3 hours
Date :

Note: answer **four** questions only. (الدرجات موزعة على جميع الأسئلة بالتساوي)

Q.1: A/ For what we use the following properties:

- 1- show and hide in the form.
- 2- caption in label.
- 3- multiline in text box.
- 4- sorted in list box.
- 5- Additem in list box.

B/ Design a form contains a textbox and a shape such that when the user enters g and b the shape colored to green and blue respectively.

Q.2:A/ Find the average of any 5 numbers using loop statement (use input box for inputting and message box for outputting).

B/ Write a program to print "welcome" five times in bold font, green color and size 18.

C/ Give two methods for inputting variables in V.B. language with an example for each one.

Q.3:A/ Write a program to find factorial of n (n!).

B/ Write the details of the following design and write the code for each button.

Q.4:A/ Write a program to compute area of a triangle with base b and high h where $A = (1/2)b.h$

B/ What is the difference between:

- 1- Check box, Option button
- 2- do while loop statement, do until loop statement.

C/ Write a program to find the smallest number between two numbers.

Q.5:A/ Write a program to compute y where $y = x + \frac{x^2}{2} + \frac{x^3}{3} + \dots + \frac{x^n}{n}$

B/ How many multipliers of 7 are there between 14 and 77? Write a program to find it.

Best wishes

**University of Technology
Department of Applied Sciences
Final Examination 2016/2017**



**Subject: Mathematics
Branch: Applied physics branch
Examiner: D. Atheer Ibrahim Abdali**

**Class: 2nd year
Time: 3 hour
Date: 2017**

Note answer Four questions only

Q1 a) Solve the O.D.E $(x^2 + y^2)dx + 2xy dy = 0$? [10 marks]

b) Find the value of X if $\begin{vmatrix} 2 & 2 & 1 \\ x & 3 & 5 \\ 3 & 0 & 2 \end{vmatrix} = 15$ [7.5 marks]

Q2 a) Find inverse Laplace transformation for

$F(S) = \frac{s-4}{(s+2)^2+81}$? [10 marks]

b) Evaluate $\int_1^3 \int_2^{x+1} (x+y) dy dx$ [7.5 marks]

Q3 a) Solve the O.D.E $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} - 6 \frac{dy}{dx} = e^{-3x} + x^2$? [10 marks]

b) Find all Extreme Value of the following function

$$f(x, y) = xy - x^2 - 2x - y^2 - 2y + 4, ?$$

**Q4 a) Solve the O.D.E by Laplace transformation $\frac{d^2y}{dt^2} + 5 \frac{dy}{dt} + 6y = e^{-2t}$
with $y(0) = 0, \dot{y}(0) = 1$ [10 marks]**

b) Find the area shared by $r = 2$ and $r = 4 \sin(\theta)$ [7.5 marks]

Q5 a) If $U(x, y, z) = \sqrt{x^2 + y^2 + z^2}$, $x(t) = t^2$, $y = \csc(3t)$ and $z = \frac{2}{t}$

Find $\frac{\partial u}{\partial t}$? [10 marks]

b) Find the inverse of matrix $\begin{vmatrix} 2 & 1 & 2 \\ 1 & 2 & 1 \\ 2 & 1 & 2 \end{vmatrix}$ [7.5 marks]

Good luck



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2016 -2017



A

Subject: Material Properties
Examiner: Dr.Sadeq H.Lafta

Class : 2nd year

Time : 3 hours
Date : / /2017

Note: Answer just 4 questions

1-A) X-rays of $\lambda = 0.1537$ nm are diffracted from the planes (111) the Bragg angle is 19.2° . Calculate the material density if it has FCC structure, Avogadro number 6.02×10^{23} atom/mole and atomic weight 26.98 g/mole. (6.5 degrees)

B) Why? (6 degrees)

- [1].The electrical conductivity of the noncrystalline metal is greater than its crystalline counterpart?
- [2].Why the FCC structure is more compact than BCC structure.
- [3].Susceptibility (χ) is negative for diamagnetic.
- [4].Screw dislocation is more substantial contribution to plastic deformation than edge dislocation.

2-A) What is the difference between: (6 degrees)

- 1. Superconductors type I and type II
- 2. Frenkel and Schottky point defects.
- 3. Brittle material and ductile material in stress-strain curve.
- 4. hard and soft magnetic materials

B) A 10m steel wire of diameter 3mm carrying load of 1.2kN. If the elastic modulus is 210 GPa what is the new length of the steel wire assuming the elongation is elastic?
(6.5 degrees)

3- A) Calculate (a) the saturation magnetization and (b) the saturation flux density for nickel. The nickel density is 8.9 g/cm³, the Bohr magnetons per atom is 0.6 μ_B and the atomic weight is 58.7 g/mol. (6.5 degrees)

B) What are the reasons for resulting magnetism? Sketch. Do all electrons have a net magnetic moment? Why or why not? Do all atoms have a net magnetic moment? Why or why not?
(6 degrees)

4- A) Find the conductivity of copper at 300K. If the collision time (τ) for electron scattering is 10^{-14} s. Copper density $\rho = 8900$ kg/m³, atomic weight=0.06354 kg/mole, $e=1.6 \times 10^{-19}$ C, $m=9.1 \times 10^{-31}$ kg.
(6.5 degrees)

B) Mention three of superconductor application. (6 degrees)

5- Answer the following shortly:

- A. Define smart material and give a short explanation about “top-down” and “bottom-up” terms.
(6.5 degrees)
- B. Sketch within a cubic unit cell the following planes: (102), (1T0), (310) (6 degrees)