



University of Technology
Department of Applied Sciences
Final Examination
2015 -2016



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

Class : 2nd year
 Time : 3 hours
 Date :

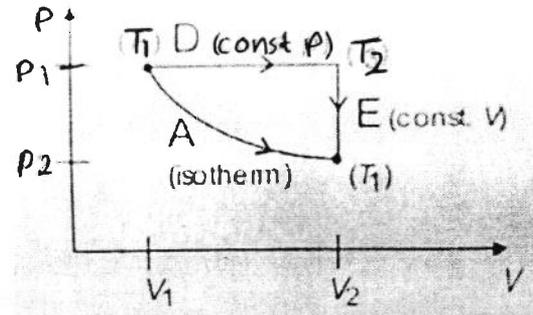
Note: Answer 4 questions only. (25 points for each question)

Q1/ A) Define of the following: (18 points)

- | | | |
|-------------------------|--------------------------------|--------------------|
| 1) Adiabatic process, | 2) Reversible process, | 3) Open system |
| 4) Spontaneous process, | 5) First law of thermodynamic, | 6) Isolated system |

B) The work output is 900 kJ and heat rejection is 150 kJ of Carnot heat engine. Find T_H if you know that $T_C=27^\circ\text{C}$. (7 points)

Q2/ Find ΔU , ΔH , q , w , and ΔS for a reversible ideal gas of curve A, D and E shown in figure, then prove that ΔU , ΔH , and ΔS are state function while q and w are not.



Q3/ A Carnot engine that operates between the temperature $T_H=850\text{ K}$ and $T_C=300\text{ K}$. The engine performs 1200 J of work each cycle, which takes 0.25 s.

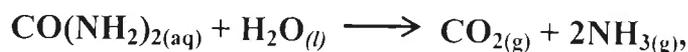
- 1) What is the efficiency of this engine.
- 2) What is the average power of this engine.
- 3) How much energy is extracted as heat from the high temperature reservoir every cycle.
- 4) How much energy is delivered as heat to the low temperature reservoir every cycle.
- 5) What is the entropy change of the working substance for the energy transfer to it from the high temperature reservoir to the low temperature reservoir.

Q4/ A) Prove that: a) PV^γ is constant along a reversible adiabatic process. b) $\Delta G = \Delta H - T\Delta S$,

B) 1 mole of $\text{N}_2(\text{g})$ 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. (use $R = 8.314\text{ JK}^{-1}$) (10 points)

Q5/ A) Prove that: a) $C_p = C_v + R$ for an ideal gas, b) $C_p = (\partial H / \partial T)_p$.

B) Is the following reaction spontaneous? (10 points)



if you know $\Delta H=119\text{kJ}$, $\Delta S=354.8\text{ j/K}$ and $T=25^\circ\text{C}$

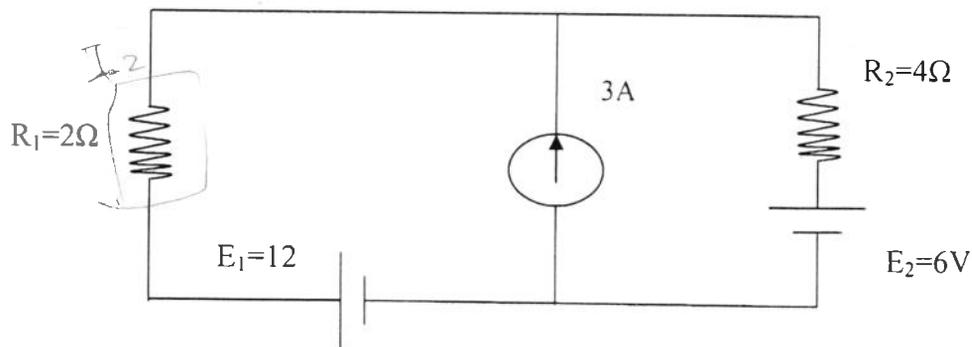


Subject : Electrical circuits
Branch : Applied physics
Examiner: Dr. Wafaa Abdul khaliq

Class : 2nd year
Time : 3 hours
Date :

Answer four questions only

Q.1-A- Find the current through the $2\ \Omega$ resistor.



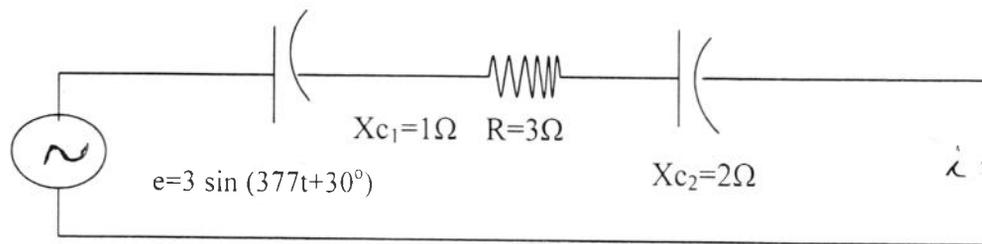
Q.1-B- Q- Find the phase relationship between the waveforms of the set

$$v=5 \sin (wt+30^\circ), i=10 \sin (wt-60^\circ).$$

Q.2 A- a-Find the total impedance Z_T in polar form.

b- Draw the impedance diagram.

c- Find the current in phasor form.



Q.2-B- 2-hp motor operates at an efficiency of 75%. What is the power input in watts? If the input current is 15 A, what is the input voltage?



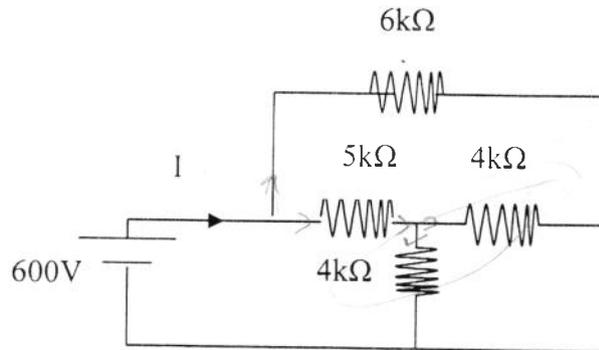
University of Technology
Department of Applied Sciences
1st term examination 2015/2016



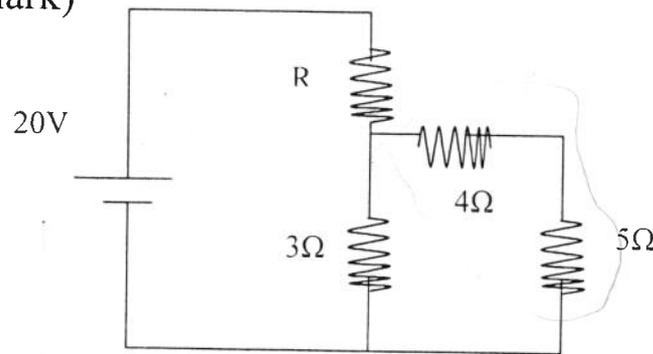
Subject : Electrical circuits
Branch : Applied physics
Examiner: Dr. Wafaa Abdul khaliq

Class : 2nd year
Time : 3 hours
Date :

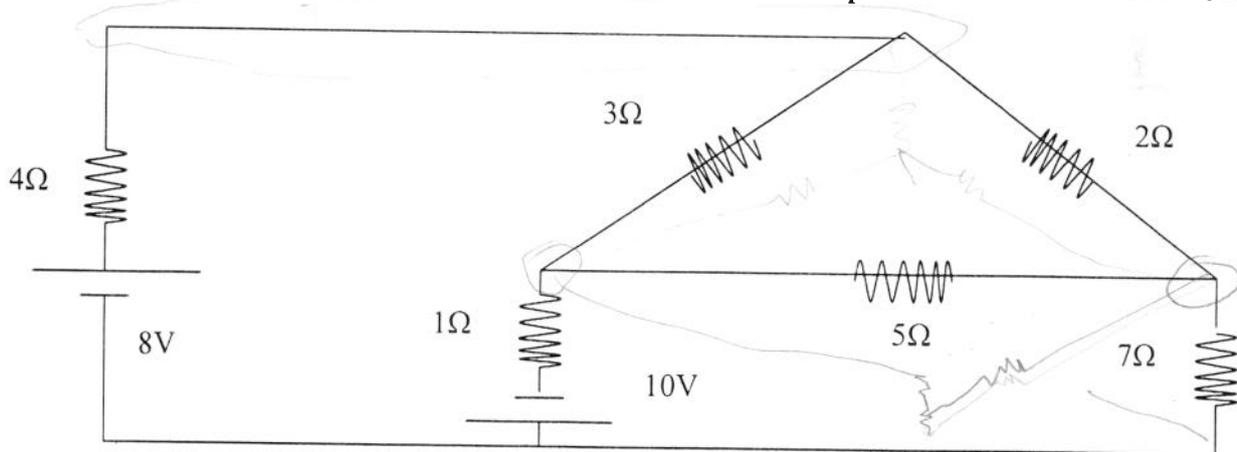
Q.3- Find the current I.



Q.4- Find the Norton equivalent circuit for the network external to the resistor R. (15 mark)



Q.5- Using the format approach, write the nodal equations for the network.





University of Technology
Department of Applied Sciences
Final Examination 2015/2016



Subject: Visual Basic
Branch : mathematics & physics
Examiner : Samaa Fuad

Class : 2nd year
Time : 3 hours
Date : 25/5/2016

Note: Answer four questions only.

Q.1: A/ For what we use: (5M)

- 1- the tool (label).
- 2- menu editor.
- 3- the function Len(x).
- 4- the property (autosize).
- 5- the dialog box (inputbox).

B/ Write a program to compute the **circumference** and **area** of a **square** after entering its side length (L) using a suitable design. (circumference= $4L$, area= L^2). (7.5M)

Q.2: A/ What is the difference between: (5M)

- 1- cint, val
- 2- int, fix
- 3- inputbox, messagebox
- 4- Conditional loop, counter loop
- 5- single, string

B/ Write a program to enter a number such that when the number is **positive greater than or equal to 50**, the message (**good luck**) will appear and when the number is **positive less than 50**, the message (**hard luck**) will appear. (7.5 M)

Q.3: A/ Explain how we can create a menu in a project, and add sub menu to the main menu. (5M)

B/ Design a form with a textbox and shape (circle). Use **select statement** so that when user enters (g and y), the shape colored to (green and yellow) respectively. (7.5 M)

Q4: A/ How we can enter many elements to a list using input box? and sort the list alphabetically? Explain that. (5M)

B/ Write a program to enter n numbers and find the average of negative numbers only. (7.5 M)

Q5: A/ How many multipliers of 7 are there between 14 to 77 ? Write a program to find that. (5M)

B/ Design a form contains two option buttons such that when click on the first option button the text will be appear in capital letters and when click on second option button the text will be appear in small letters. (7.5 M)

Best wishes



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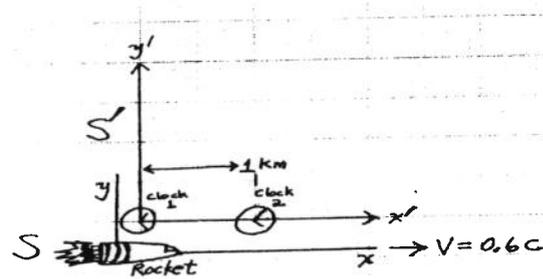
Subject : modern physics
Branch : Applied physics
Examiner :Dr. Esam A. Tawfiq

Class: second level
Time : 3 hours
Date :

NOT: ANSWER FOUR QUESTIONS ONLY

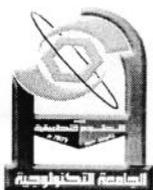
- 1- (a) An electron with kinetic energy of 1000eV has a wavefunction given by $y(x,t)=A\sin(kx-\omega t)$
- What is the relation between the wavenumber and the kinetic energy.
 - Find the value of the wavenumber (k) for this 1000 eV electron wave.
 - Find the value of (ω) for this electron wave.
 - What is the value of the velocity of this electron wave.

- (b) suppose there are two space stations at rest relative to each other and separated by a distance of 1 Km . A rocket is traveling at 0.6c along the line connecting the two space stations. At time $t=0$ the



rocket reaches the first station just as its clock light up. According to the rocket .how far away the other space station

- 2- (a) A photon with an energy of 120 keV scatters from a free electron at rest. The angle of scattering is 60° . (a) What is the initial wavelength of the photon? (b) What is the final energy of the photon? (c) What is the final kinetic energy of the scattered electron?
- (b) What kinetic energy in eV should electrons have, so that their de Broglie wavelength is 1.25 nm?
- 3- (a) A photon with an initial energy of 14 keV scatters off of a free electron and changes direction by 55° . What is the wavelength of the scattered photon? What is the recoil speed of the electron?
- (b) A spaceship is 75 m long according to an astronaut on the ship. As it travels away from Earth, scientists on the ground measure the length of the ship to be 51 m. How fast is the spaceship traveling away from Earth?
- 4-(a) Light (electromagnetic radiation) is incident on a silver plate. What is the threshold frequency of the light in order for electrons to be freed in the silver? If light with twice the threshold frequency strikes the plate, what is the maximum kinetic energy of the freed electrons? What is the speed of the electron in this case? What will happen if visible light strikes the silver?(work function of silver is 4.3eV).



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Subject : modern physics
Branch : Applied physics
Examiner :Dr. Esam A. Tawfiq

Class: second level
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(b) Find the lowest energy level for a particle in a box if the particle is a billiard ball (0.200 kg) and the box has a width of 1.5 m, the size of a billiard table. (Assume that the billiard ball slides without friction rather than rolls. That is, ignore the rotational kinetic energy.) (b) Since the energy in part (a) is all kinetic, to what speed does this correspond? (c) How much time would it take at this speed for the ball to move from one side of the table to the other? (d) What is the difference in energy between the $n = 2$ and $n = 1$ levels?

5- answer two only

- (a) An electron in a long, organic molecule used in a dye laser behaves approximately like a particle in a box with width 4.18 nm. (a) What is the wavelength of the photon emitted when the electron undergoes a transition from the first excited level to the ground level? (b) What is the wavelength of the photon emitted when the electron undergoes a transition from the second excited level to the first excited level?
- (b) Calculate the energy in eV of a neutron (mass 1.675×10^{-27} kg) that has de Broglie wavelength of 4.1×10^{-12} m.
- (c) How fast must a meter stick be moving if its length is observed to shrink to 0.5m?

GOOD LUCK



University of Technology
Department of Applied Sciences
Final Examination 2015/2016



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

Class: 2nd year
Time: 3 hour
Date: 2016

Note answer Four questions only

Q1\ (a) Solve the O.D.E $\frac{dy}{dx} + \tan x \sin y = \sin x \sin y^3$? [10 marks]

(b) Find Laplace transformation for the following function
 $f(t) = e^{2t}(t + \sin t)$? [7.5 marks]

Q2\ (a) Find Fourier series for the Following Function
 $f(x) = x + 1$ over the interval $0 \leq x \leq 2\pi$? [10 marks]

(b) Find $\frac{dw}{dt}$ if $w = x^2 + 2xy - 3xz^3$, $x = e^t$,
 $y = \sin t^2$, $z = t^3$? [7.5 marks]

Q3\ (a) Solve the O.D.E $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 3y = e^{5t}$ with $y(0) = 0$, $\dot{y}(0) = 1$
 by using Laplace transformation ? [10 marks]

(b) Find the area bounded by $y = x^2$ and $y = 6 + x$? [7.5 marks]

Q4\ (a) evaluate $\int_0^1 \int_0^x (x + yx) dy dx$ [7.5 marks]

(b) Find inverse Laplace transformation for the following function
 $(s) = \frac{s+2}{(s-3)^2-25}$? [10 marks]

Q5\ (a) The radius and height of a right circular cone at a given instant (t_0) are $r(t_0) = 20$ cm and $h(t_0) = 30$ cm, respectively. If (h) and (r) increasing at a rate of (2 cm/sec) and (1 cm/sec). Respectively. Find the rate at which the Volume is increasing at this instant ? [10 marks]

(b) Evaluate $\int_0^2 \int_0^{\sqrt{4-x^2}} dy dx$ by changing in to polar coordinate.

Good luck [7.5 marks]



University of Technology
Department of Applied Sciences
Branch Of Applied Physics
Final Examination
2015 -2016



A

Branch: Applied Physics
Subject: Material Properties
Examiner: Sadeq H.Lafta

Class : 2nd year
Time : 3 hr
Date :

Choose only four questions

Q1.

- A) What are the curves that represent: 1) the mechanical properties 2) the magnetic properties? Give simple sketch with axes labels. (4 degree)
- B) 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 degree)

Q2.

- A) Define smart material and give a short explanation about "top-down" and "bottom-up" terms. (4 degree)
- B) Calculate the true stress at fracture for a metal rod whose engineering fracture strength is 450MPa and whose diameter at fracture was reduced by plastic deformation from 1 to 0.8 cm. (6 degree)

Q3.

- A) What is the main difference between? (6 degree)
- 1- Non-superconductor and superconductor in resistivity-temperature curve.
 - 2- Ductile material and brittle material.
 - 3- Hard and soft magnetic materials.
- B) Draw the following planes: (102) and (111). (4 degree)

Q4.

- A) Why? : (4 degrees)
- 1- Electric field is sufficient to excite electrons in metals?
 - 2- Completely filled electron bands are diamagnetic.
- B) Calculate (1) Saturation magnetization (2) saturation flux density for nickel of density 8.9 gm/cm³ magnetic moment per atom is 0.6 μ B. Nickel atomic weight is 58.9 g/mole. (6 degrees)

Q5.

- A) Define shortly: (4 degree)
- 1-Fermi Energy, 2-Poisson ratio, 3-saturation magnetization, 4-Bohr Magneton.
- B) Copper wire has a (3mm) diameter and (2m) long, its conductivity $s=6 \times 10^7$ ($\Omega \cdot m$)⁻¹, compute: 1) the resistance of wire, 2) the current flow if the potential drop across the ends is 0.05V? 3) the current density? 4) the magnitude of the electric field across the ends of wire? (6 degree)

GOOD LUCK

