Tanta University

Electronics and Electrical Communications
Engineering Department

Faculty of Engineering

Course Title	Technical Reports (تقارير فنية)	Academic Year 2021/2022 First-Semester Exam	Course Code	EEC21H3
Year/ Level	Second year/ Level 2			
Date	2/2/2022	No. of Pages (2)	Allowed time	2 hrs
Maximum Mark: 40		Remarks: Please answer all the following questions		

Question Number (1) (10 Marks)

a) **Write 'True' or 'False' with correcting the false statements:** (5 Marks)

1. The informal reports do not include content page.
2. The tree diagram is used to assess the reason for writing.
3. In the formal report, the front section includes the summary, introduction, and conclusion.
4. The appendix exists at the end of the research article before the conclusions.
5. The used citations in the abstract are not inserted in the references list.
6. The conclusions are the inferences made from the findings.
7. The letter of transmittal is a covering letter.
8. The table of contents lists the sections of the report in a column form using the sections numbering used in the body of the report.
9. Using the American Psychological Association style, the last author's last name and the date of publication are used in the citation.
10. We must put the abbreviations between parentheses each time they appeared.

b) **Give an example for tree diagram and its corresponding point-form outline for a proposed literature review topic.** (5 Marks)

Question Number (2) (10 Marks)

a) **Re-write the following structures by removing the redundant/excess words:** (5 Marks)

1- are made arranged for
2- performed the development of
3- period of time
4- had done previously
5- mix together

b) **Define the word 'Appendix'. Then, for an original research article titled 'Embedded systems in industrial applications', which is authored by Mohamed Salah, and Ahmed Hassanien, and published in an international journal named Signal and Information Processing. This article is published in volume 6 and issue number 3 in 25 pages from page 244 in the year 2020. Use the APA and the MLA formats to list this paper in the references list.** (5 Marks)

Question Number (3) (10 Marks)

a) **In technical report writing and presentations, state the elements of good technical communication.** (5 Marks)

b) **Mention the general guidelines for writing the captions of the figures and tables in the technical writing.** (5 Marks)

Question Number (4) (10 Marks)

a) **Re-arrange the following unordered abstract based on the structure rules of the abstract, then; suggest a title based on the arranged abstract, and mention the restrictions during writing an abstract?** (5 Marks)

Unordered abstract:

A comparative analysis of all the wearable technology in healthcare is discussed in this review article with tabulation of various research and technology. The next step in healthcare is to integrate it with IoT-assisted wearable sensor systems seamlessly. This review rigorously discusses the various IoT architectures, different methods of data processing, transfer, and computing paradigms. Internet of Things (IoT) has played an essential role in many industries over the last few decades. Recent advancements in the healthcare industry have made it possible to make healthcare accessible to more people and improve their overall health. This review also analyses all the problems commonly faced in IoT-assisted wearable sensor systems and the specific issues that need to be tackled to optimize these systems in healthcare and describes the various future implementations that can be made to the architecture and the technology to improve the healthcare industry. It compiles various communication technologies and the devices commonly used in IoT-assisted wearable sensor systems and deals with its various applications in healthcare and their advantages to the world.

b) **Rewrite the following statements in a formal way:** (5 Marks)

A. I found that the fittings were defective.
B. In my view, the market value will rise in the spring.
C. The product is not of a satisfactory nature.

End of questions with best wishes

Course Coordinator	*Examination Committee*
Assistant Prof. Amira Salah Ashour	*Assistant Prof. Amira Salah Ashour* *Assistant Dr. Mahmoud Seliem* *Dr. Hussein Eltybee* *Dr. Nancy Elshaer*

Tanta University

Department: Physics and Engineering Mathematics
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Engineering Mathematics 3(a) Course Code: PME2109, : PME2110 Year: 2nd
Date: 30/1/ 2022 (First term) Allowed time: 3 hrs No. of Pages: (2)

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

Problem number (1) (40 Marks)

a) Use the values given by $f(x) = x^3 + 2$ at $x = 0, 0.2, 0.4, 0.6, 0.8, \text{and } 1.0$ to find $S_1(x)$ and approximation of $f(x)$ at $x = 0.1, 0.3$ using the Natural Cubic Spline Interpolation.

b) Prove that $f''(x) \simeq \frac{f(x+h) - 2f(x) + f(x-h)}{h^2}$ and $T.E \le \frac{h^2}{12}\left|f^{(4)}(c)\right|, \quad x-h \le c \le x+h$

c) Use Gaussian quadrature (1- midpoint, 2- points, and 3- points) formula to evaluate the integral $I = \int_0^1 \frac{dx}{1+x^2}$ then determine the absolute error.

d) Solve the initial value problem (IVP) by using Euler method $\frac{dy}{dx} = (2x - y), x_o = 0, y_o = -1$. To get the value of (y) at (x=0.5) with (h=0.1) compare the values of the exact solution $y(x) = e^{-x} + 2x - 2$.

Problem number (2) (45 Marks)

a) Use the Adams third order Predictor Corrector Method to obtain an approximation to the Solution of the initial value problem (IVP) $\frac{dy}{dx} = (2x - y), x_o = 0, y_o = -1$ with (h=0.1) to approximate (y) at (x=0.4)

b) Take the case of a pressure vessel that is being tested in the laboratory to check its ability to withstand pressure. For a thick pressure vessel of inner radius a and outer radius b, the differential equation for the radial displacement u of a point along the thickness is given by

$$\frac{d^2u}{dr^2} + \frac{1}{r}\frac{du}{dr} - \frac{u}{r^2} = 0$$

The inner radius $a = 5''$ and the outer radius $b = 8''$. The boundary conditions are:

$$u\big|_{r=a} = 0.0038731''$$

$$u\big|_{r=b} = 0.0030769''$$

Divide the radial thickness of the pressure vessel into 6 equidistant nodes. Solve by using finite difference method. Take $\frac{du}{dr} \approx \frac{u_{i+1} - u_i}{\Delta r}$

c) Find the numerical solution of wave equation $\alpha^2 u_{xx}(x,t) = u_{tt}(x,t), \quad 0 < x < l, \quad 0 < t < T$

Using implicit method.

Where at $j = 0$

$$2u_i^1 - \lambda^2(u_{i+1}^1 - 2u_i^1 + u_{i-1}^1) = 2f_i + 2k\, g_i - k\lambda^2(g_{i+1} + 2g_i + g_{i-1})$$

d) Approximate the solution of the wave equation $u_{xx} = u_{tt}$, $0 < x < 1$, $t > 0$ subjected to the initial and boundary conditions:

$u(x,0) = \sin(\pi x), \quad 0 \le x \le 1$

$u_t(x,0) = 0, \quad 0 \le x \le 1$

$u(0,t) = u(1,t) = 0, \quad t > 0$

Use the implicit method with using $h = k = 0.25$

Dr. Ashraf Al Mahalawy and the committee

Tanta University
Faculty of Engineering
Electrical Power and Machines Engineering Dept.

Final Exam – First Semester 2021-2022

Course: EPM2104/EPM2141(Electromagnetic Fields)	**Time allowed:** 3 hr
Year: 2nd Elec. Power / Communications Eng.	**Date:** Jan 12, 2022
No. of Pages: 2	**Total Score:** 85

Remarks: Attempt to solve all of the following questions

Question 1 — **24 Points**

Choose the correct answer for the following statements:

(Verification of your choice is A MUST when numerical data are given)

(1) Electric _____ at a point may be defined as equal to lines of force passing normally through a unit cross-section at that point

(a) field intensity (b) flux (c) flux density (d) potential

(2) Plane z = -10 m carries charge -20 nC/m^2. The electric field intensity at the origin is

(a) $-10a_z$ V/m (b) $-18\pi a_z$ V/m (c) $360\pi a_z$ V/m (d) $-360\pi a_z$ V/m

(3) An infinite sheet has a charge density of 150 μC/m^2. The flux density in μC/m^2 is ____.

(a) 50 (b) 75 (c) 100 (d) 1/75

(4) Point charges 30 nC, -20 nC, and 10 nC are located at (-1,0,2), (0,0,0), and (1,5,-1) , respectively. The total flux leaving a cube of side 6 m centered at the origin is:

(a) -20 nC (b) 20 nC (c) 10 nC (d) 30 nC

(5) A potential field is given by $V = 3xy - 5y$. Which of the following is not true?

(a) The potential difference between point (2, -1, 4) and point (2, -1, -4) is zero.

(b) At point (1, 0, -1), E vanish.

(c) The electric field at (2, -1, 4) is $3a_x - a_y$ V/m.

(d) The potential at (0, 1, 0) is -5 V.

(6) Which is not an example of convection current?

(a) Electric current flowing in a copper (b) A beam of moving charges

(c) Electronic movement in a vacuum tube (d) An electron beam in cathode ray tube

(7) The relaxation time of a material having $\sigma = 10^{-17}$ mho/m and $\varepsilon_r = 5$ is

(a) 5×10^{-10} seconds (b) 10 minutes (c) 15 hours (d) 51.2 days

(8) In a dielectric material an applied field in x direction $E_x = 6$ V/m gives a polarization of $P_x = 1/(6\pi)$ nC/m^2. The permittivity of the material is ____ pF/m.

(e) 1 (f) 2 (g) 17.68 (h) None of these

(9) Electric field inside a hollow metallic charged sphere is ____.

(a) increasing towards (b) decreasing towards (c) still (d) None of

(10) A capacitor connected to a battery stores energy twice as much with a given dielectric as it does with air. The susceptibility of the dielectric is

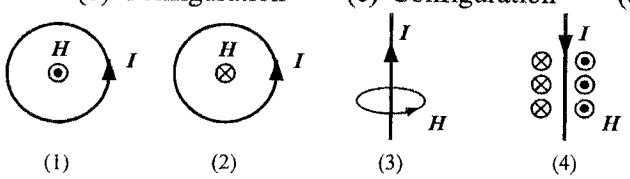
(e) 0 (f) 2 (g) 1 (h) 3

(11) The electrostatic field is _____ field.

(a) conservative (b) non-conservative (c) solenoidal (d) None of these

(12) Identify the configuration in the figure that is not a correct representation of I and H

(a) Configuration (b) Configuration (c) Configuration (d) Configuration



(1) (2) (3) (4)

Question 2 — **14 Points**

State true (√) or false (×) and **correct the false statements**

(1) Both ε_o and χ_e are dimensionless.
(2) The electric flux density on a spherical surface r = b produced by a point charge Q located at the origin is the same as that produced by a charge of the same value as Q but distributed over the surface r=a where a<b.
(3) Inside a conductor, the electric field intensity is changes with the position.
(4) A conductor is an equipotential body.
(5) The dielectric strength is the maximum magnetic field that a dielectric can tolerate or withstand without breakdown.
(6) For a free-charged dielectric-dielectric interface, the tangential components of the electric flux density in the two materials are equal.
(7) An isolated magnetic pole exists.

Question 3 — **20 Points (10+10)**

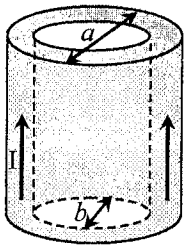
[A] A uniform surface charge density $\boldsymbol{\rho_s}$ is distributed over a cylindrical surface of radius $\boldsymbol{a}$ and extending from $\boldsymbol{z = -h}$ to $\boldsymbol{z = h}$. Find (a) the total charge on the finite cylindrical surface. (b) the electrostatic force on a unit positive charge located in free space at (0,0,k).

[B] Planes $x = 2$ and $y = -3$ respectively carry the same charge of $10/\pi$ nC/m^2. If the line $x = 0$, $z = -2$ carries charge 10 nC/m, calculate the electrostatic field intensity at the point (0,1,-1) due to the charge distributions.

Question 4 — **27 Points (6, 15, 6)**

[A] An infinitely long straight filament carries current of (I) lies in free space along z-axis.
(a) Use Biot-Savart's law to obtain the magnetic field intensity and the magnetic flux density at point (0,4 meters,0).
(b) Determine the force, $\bar{F}$ exerted on the filament if the area surrounding it has a magnetic flux density of $\bar{B} = \hat{a}_x - \hat{a}_y$ wb/m^2. (Use the following relation, $\bar{F} = \oint I\overline{dL} \times \bar{B}$)

[B] Consider an infinite length hollow conducting tube of conductivity σ_1 S/m carrying a current I with a uniform current density as shown in the figure.
(i) Apply Ampere's law to derive expressions for the magnetic field intensity everywhere and sketch the results as a function of the radius r
(ii) Derive a formula for the resistance per unit length of the tube
(iii) The space 0 < r < b is now filled with a conducting material whose conductivity is σ_2 S/m. Current I in Ampere, flows through the area $0 < r < a$ with a constant current density. Derive a formula for the voltage drop across each unit length of the filled tube



[C] Write down Maxwell equations for steady magnetic field and static electrical field in both differential and integral forms. Explain the modifications required for time varying fields.

Wish you all the best **Dr. Mohamed Elnemr and Dr. Sherif Dabour**

Course Title	Communication Theory	Academic Year 2021/2022 First- Semester Exam Total Marks: 100		
Year/ Level	Second Year / First Semester		Course Code	EEC 2104
Date	23-01-2022	No. of Pages (4)	Allowed time	3 hrs
Repoints: (Answer sequentially from left to right using blue pen and do not use pencil or red pen)				

Answer the Following Questions

Question Number (1) (20 Points)

a) Draw the functions: $\frac{1}{2}rect\left(\frac{t+2}{2}\right)$ & $sinc[2\pi\,(1000)\,t]$ & $u(2-t)$ (4 Points)

b) Prove the Fourier transform and the inverse Fourier transform expressions from the exponential Fourier series (4 Points)

c) Define, write the mathematical expression, and state the importance of: (4 Points)

1. Modulation theory
2. Convolution
3. Correlation

d) If you are given that $e^{-\frac{t}{\tau}}u(t) \leftrightarrow \frac{1}{1+j\omega}$ obtain the Fourier transform of following function: $f(t) = e^{-\frac{t}{\tau}}u(t) * cos(\omega_c t)$ then draw it (4 Points)

e) Draw the standard rect or gate function. Then explain with drawing the graphical steps to estimate the convolution of two identical rect functions. (4 Points)

Question Number (2) (20 Points)

a) Explain with the aid of drawing the properties of autocorrelation function indicating its meaning and importance. (4 Points)

b) Explain the following in details: (4 Points)

a. Deterministic and random signals with examples
b. Impulse response of a linear time invariant system
c. Output response and prove it

c) Prove in details how to estimate the impulse response of an ideal linear time invariant distortion less LPF, than draw it and comment, then compare it without proof to the practical LPF filter. (4 Points)

d) What is the relation between rice time and system bandwidth. Show without proof how to get the rice time of a simple practical RC low pass filter. Then estimate the bandwidth corresponding to 90% of its final value. (4 Points)

e) Define DSB.SC, write its expressions in time and frequency domain, draw it in time and frequency domain assuming the information $f(t) = \cos 2\pi\,(1000)t$ whereas the carrier of unity amplitude and frequency 50 kHz. (4 Points)

BSc Program
Electronics and Electrical Communications Engineering Dept.
Tanta University — Faculty of Engineering

Question Number (3) (20 Points)

a) Explain one method to demodulate DSB.TC signal, indicating its conditions, advantages and drawbacks. (4 Points)

b) Prove with drawing the phase shift method to get SSB.SC. Comment briefly concerning its synchronous detection. (4 Points)

c) Explain the VSB amplitude modulation system indicating how to generate, its merits and its applications in TV broadcasting. (4 Points)

d) Define the modulation efficiency and modulation index. If the carrier amplitude is 10 volts whereas the transmitted signal is sinusoidal with amplitude 5 volts, estimate the modulation efficiency and index for DSB.SC, DSB.TC, and SSB.SC. (4 Points)

e) Illustrate the frequency band assigned to AM audio broadcasting, indicating its type of modulation, number of channels. Then explain briefly the superheterodyne concept and its importance. (4 Points)

Question Number (4) (20 Points)

a) Deduce an expression for a general FM signal both in time and frequency domains. Then comment about its instantaneous phase angle and frequency. (4 Points)

b) Define, analyse, draw, and comment about NBPM as compared to AM. (4 Points)

c) Define and show how to estimate the peak frequency deviation, modulation index, and transmission bandwidth of FM angle modulation technique. (4 Points)

d) Analyse the general expression for FM assuming sinusoidal input to get the time domain expression for WBFM system. (4 Points)

e) Define the Bessel function and show how to use it to estimate the bandwidth of WBFM system. Then show that bandwidth based on Bessel coefficient is equivalent to Carlson bandwidth. (4 Points)

Question Number (5) (20 Points)

a) Explain one method to generate a WBFM signal at the transmitter. (4 Points)

b) Select the correct answer of the following: (4 Points)

A symmetrical periodic square wave can be expanded by FS into

a	a linear combination with different weights of periodic functions.	o
b	a linear combination with different weights of aperiodic functions.	o
c	a linear combination with different weights of non-periodic functions.	o
d	a linear combination with equal weights of periodic functions	o

The delta function

a	is periodic signal.	o
b	is a non-periodic signal.	o
c	is both periodic and aperiodic signal.	o
d	is neither periodic nor aperiodic signal.	o

The modulation theorem is

a to increase the power of the information signal. o
b to increase the amplitude of the information signal. o
c to increase the frequency of the information signal. o
d to increase the phase of the information signal. o

Cross correlation is to measure the relation (or similarity)

a between two functions one of them is shifted. o
b between two functions one of them is shifted and reflected. o
c between two functions one of them is shifted, reflected, and multiplied by 2π. o
d between the function and itself after shift. o

c) Select the correct answer of the following: (4 Points)

How to estimate the characteristics of a linear time invariant system

a by applying a unit step signal to the system input. o
b by applying an impulse signal to the system input. o
c by applying a signup signal to the system input. o
d by applying a sinusoidal signal to the system input. o

In frequency domain analysis to get the output response g(t)

a get $H(\omega)$ from $h(t)$, then multiply $G(\omega) = F(\omega)\,H(\omega)$, then get $g(t)$ o
b get $H(\omega)$ from $h(t)$, the convolution $G(\omega) = F(\omega) * H(\omega)$, then get $g(t)$ o
c get $h(t)$ from $H(\omega)$, then the convolution $g(t) = f(t) * h(t)$ o
d none of the above. o

The transfer function

a describes the system characteristics in time domain o
b describes the system characteristics in frequency domain o
c describes the system characteristics in both time and frequency domains o
d none of the above o

Distortion in frequency domain is due to

a attenuation of the different harmonics o
b amplification of the different harmonics o
c change in the relative weights of different harmonics o
d none of the above o

d) Select the correct answer of the following: (4 Points)

Why modulation could be used prior to transmitter

a to reduce the complexity of the transmitter o
b to reduce the complexity of the receiver o
c to allow the use of wireless communication channels o
e to allow noise reduction of the communication channel o

Human voice is a low pass signals cannot be transmitted directly

a due to the limitation of the transmitter amplifiers o
b due to the limitation of the transmitter filters o
c due to the limitation of the transmitter attenuators o
e due to the limitation of the transmitter antennas o

SSB.SC amplitude modulation system

a saves power to one fourth o
b saves power to one half o

c saves power to one third o
d does not save power but saves bandwidth o

The side band filter used in VSB generation should have

a odd symmetry response at its cutoff frequency o
b odd symmetry response at the carrier frequency o
c odd symmetry response at the modulating signal frequency o
f odd symmetry response at the origin o

e) Select the correct answer of the following: (4 Points)

The frequency multiplier

a is a linear circuit followed by filter o
b is a linear circuit followed by an appropriate BPF filter o
c is a nonlinear circuit followed by an appropriate BPF filter o
d is a nonlinear circuit alone o

Usually, WBFM systems operate at very high frequencies

a to increase its bandwidth. o
b to get a suitable sensitivity. o
c to decrease its bandwidth. o
d none of the above. o

The average power of an angle modulation techniques

a depends on the carrier and depends on the modulating signal o
b independent on the carrier and depends on the modulating signal o
c depends on the carrier and independent on the modulating signal o
d none of the above o

In Stagger tuneable discriminator, the carrier

a is the cut-off frequency of the lower tuned circuit. o
b is the average of the cut-off frequencies of the upper and lower tuned circuits. o
c is the cut-off frequency of the upper tuned circuit. o
d is the sum of the cut-off frequencies of the upper and lower tuned circuits. o

End of questions

Mahmoud A A Ali

Wish you success and progress

Examination Committee

Prof. Mostafa Abd El Naby, Associate Prof. Mahmoud A. A. Ali, Associate Prof. Ro Ismaeel Abd El-Fatah, and Dr. Heba El-khopy

Course Coordinator: Associate Prof. Mahmoud A. A. Ali

Tanta University — Department: Electronics and Electrical Communication Eng. — Faculty of Engineering

Total Marks: 90 Marks

Course Title: Electronic Circuits (1) | Course Code: EEC 2103 | Year: 2nd

Date: 26 /1/ 2022 | Allowed time: 3 hours | No. of Pages: (3)

Remarks: (assume any missing data… answers should be supported by equations and sketches)

Question #1

Choose the correct answers and complete the missing words for the following:

(In your answer, write only the chosen or missing words)

1. The larger the level of load resistance, the ..... is the level of ac gain, whereas the smaller the internal resistance of the signal source, the ..... is the overall gain.
2. An amplifier that operates in the linear region at all times (Class A/ Class B/ Class AB / Class C).
3. The transistors in a class B amplifier are biased into ……..
4. Crossover distortion is a problem for ..... amplifiers.
5. A BJT class-B push-pull amplifier with no transformer coupling uses (two npn transistors / two pnp transistors/ complementary symmetry transistors/ none of these).
6. The transistor in a class-C amplifier conducts for …….
7. The efficiency of a power amplifier is defined as ……..
8. The maximum efficiency of a class-A power amplifier is …….
9. The maximum efficiency of a class B push-pull amplifier is …….
10. Thermal Runaway is a problem with ……. power amplifier. It means ……
11. Compliance is defined as ……
12. Darlington amplifiers have ..... input impedance, ... output impedance, very ..... current gain, and voltage gain .....
13. The basic requirements for any power amplifier are …….. , and …….
14. Advantages of tuned amplifiers are ....., and .....
15. A major disadvantages of the differential amplifier are ....., and .....
16. CMRR is an abbreviation of ..... It is calculated by .....
17. CMRR is a measure of an op-amp's ability to .....
18. For an A/D converter producing four binary numbers on its output, this requires number of ……. comparators.

Question (2)

(a) Calculate: dc input power $P_i(dc)$, ac output power $P_o(ac)$, and efficiency η of the amplifier circuit shown in figure 1. If an input voltage results in a base current of 10mA peak.

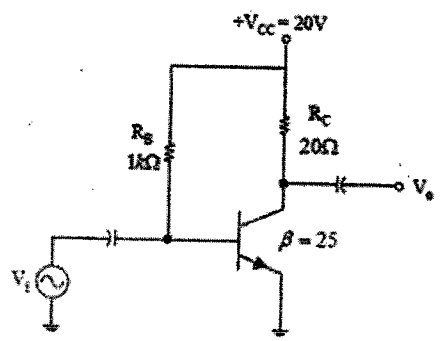


Figure (1)

(b) For the circuit shown in Figure 2. Answer the following:

i. Find the operating point (I_{CQ}, V_{CEQ}).

ii. Sketch clearly the dc and ac load line.

iii. Find the maximum symmetrical swing for current and voltage.

iv. Sketch waveforms for i_C , and v_{CE} .

(Consider: $\beta = 50$)

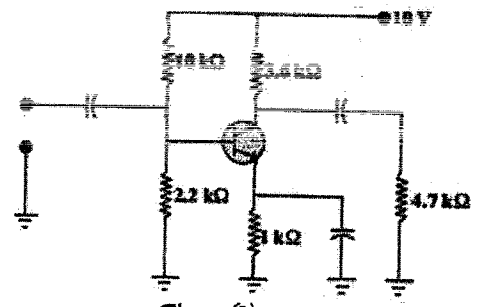


Figure (2)

Question (3)

(a) Find V_{out} in terms of V_1 and V_2 for the circuit shown in Figure (3).

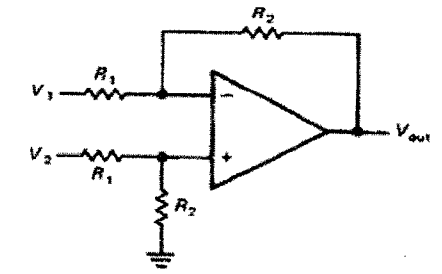


Figure (3)

(b) For the D/A converter circuit shown in Figure (4). Detemine the output voltage for input 0100. (Consider binary digit "1" corresponding to high level of 5v)

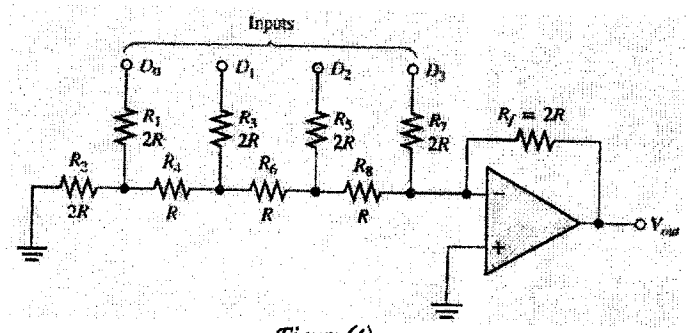


Figure (4)

Question (4)

(a) For the circuit shown in Figure (5), determine: r_e , Z_i , Z_o , A_i , and A_v .

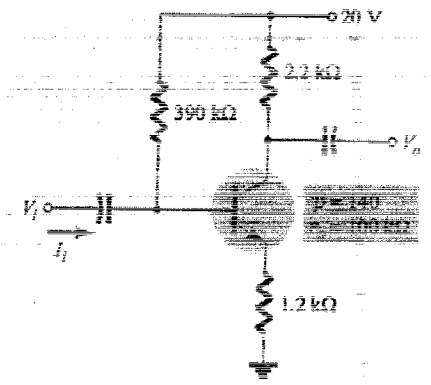


Figure (5)

(b) For the circuit shown in Figure 6, determeine the following :

i. State the name of the circuit shown, and the purpose of it.

ii. The function of R_2, and Q_2.

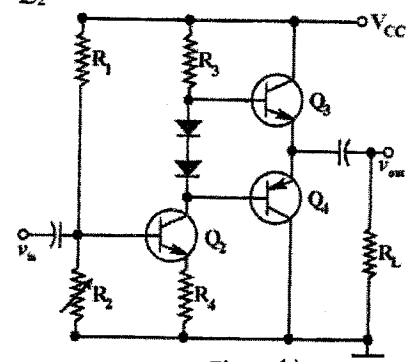


Figure (6)

(c) For the circuit shown in Figure 7, determeine the following :

i. State the name of the circuit shown, and the purpose of it.

ii. The overall volatge gain.

iii. If $V_1 = V_2$; find V_o.

iv. If $V_1 = -V_2$; find V_o.

v. CMRR.

vi. What is the practical circuit for this type of circuits?

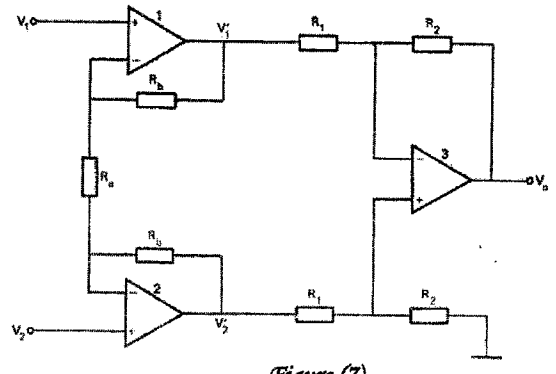


Figure (7)

Best Wishes of Success

Dr. Heba A. El-Khobby+ Examination Committee

Course Title: Electronic Measurements (1) **Course Code: EEC2105** **Year: 2nd year**
Date: 16/1/2022 **Allowed time: 3h** **No of Pages (6)**

Remarks: (This question paper must be submitted with your answer form. Answer questions No.1 and No. 2 in the electronic answer form and question No.3 in the answer notebook)

Question (1) Choose the correct answer

1) In ac circuits, the connection of measuring instruments cause loading errors which may affect
(a) only the phase of the quantity being measured
(b) only the magnitude of the quantity being measured
(c) both the phase and the magnitude of the quantity
(d) magnitude, phase and the waveform of the quantity being measured

2) The main advantage of the null balance technique of measurement is that
(a) it gives a quick measurement
(b) it does not load the medium
(c) it gives a center zero value at its input
(d) it is not affected by temperature variation

3) -------- is a measure of the degree to which successive measurements differ from one another.
(a) Accuracy
(b) Resolution
(c) Precision
(d) Speed of response

4) Schering bridge can be used for measurement of
(a) capacitance and dissipation factor
(b) dissipation factor only
(c) inductance with inherent loss
(d) capacitor but not dissipation factor

5) The advantage of Hay's bridge over Maxwell's inductance–capacitance bridge is that:
(a) its final balance equations are independent of frequency
(b) it reduces cost by not making capacitor or inductor as the variable parameters
(c) it can be used measuring low Q inductors
(d) it can be used measuring high Q inductors

6) The Wheatstone bridge is the most commonly used circuit for measurement of ------- range resistances.
(a) small
(b) medium
(c) high
(d) very high

7) Two sets of readings are taken in a Kelvin's double bridge with the battery polarity reversed to
(a) eliminate the error due to contact resistance
(b) eliminate the error due to thermo-electric effect
(c) eliminate the error due to change in battery voltage
(d) all of the above

8) -------- is used for measurements of capacitors having inherent dielectric losses.
(a) Modified De Sauty's bridge
(b) Hay's bridge
(c) Maxwell's bridge
(d) Wien's bridge

9) The strain gauges should have low
(a) resistance temperature coefficient
(b) resistance

(c) gauge factor
(d) all of the above

10) ------- converts measurand input into electrical signal (voltage/current).
(a) Passive
(b) Primary
(c) Active
(d) Secondary

11) Which of the following devices can measure pressure directly?
(a) Bourdon tube
(b) Rotometer
(c) Both (a) and (b)
(d) Neither (a) nor (b)

12) Inductive transducer used for converting the linear motion into proportional output electrical voltage
(a) Strain gauge
(b) POT
(c) Hall effect sensor
(d) LVDT

13) ------ represents the changes in the lattice structure of the material.
(a) Piezoelectric effect
(b) Hall effect
(c) Piezoresistive effect
(d) Thermal effect

14) ------- is an instrument designed to measure relative amplitudes of single frequency components in a complex waveform.
(a) CRO
(b) Wave analyser
(c) Harmonic distortion analyser
(d) Spectrum analyser

15) The bandwidth of RF spectrum is approximately
(a) 20 Hz to 20 kHz
(b) 3 kHz to 300 GHz
(c) 3 GHz to 3000 GHz
(d) 3 Hz to 300 MHz

16) In heterodyne wave analyser, the frequency of the mixer's output signal is the ------ of the frequencies of the two input signals.
(a) difference
(b) sum
(c) same
(d) multiplication

17) In selective wave analyser, ------ provides auxiliary output for secondary devices.
(a) output amplifier
(b) driver amplifier
(c) output meter
(d) output buffer

18) A ---------- measures the magnitude of an input signal versus frequency within the full frequency range of the instrument
(a) harmonic distortion analyser
(b) selective wave analyser
(c) spectrum analyser
(d) Oscilloscope

19) In filter bank spectrum analyser, the -------- controls the electronic switch and the CRT horizontal driver
(a) Ramp generator
(b) Filter
(c) detector
(d) mixer

20) In superheterodyne spectrum analyser, the detector output controls the -------
(a) mixer.
(b) CRT horizontal plates.
(c) VCO.
(d) CRT vertical plates.

21) Lumped parameters and distributed parameters are two types of
(a) electronic delay line
(b) electromagnetic delay lines.
(c) trigger circuits.
(d) sweep generators.

11) The output voltage of a potentiometer varies nonlinearly with the displacement.
a) True b) False

12) Carriers' concentration in a semiconductor can be calculated using strain gauges
a) True b) False

13) In frequency selective wave analyser, the resistance is varied for frequency control
a) True b) False

14) The input attenuator in heterodyne wave analyser can be implemented by passive or active attenuator.
a) True b) False

15) High Q-filter is the main block in heterodyne wave analyser
a) True b) False

16) The display of a spectrum analyser has frequency on the horizontal axis and the amplitude displayed on the vertical axis.
a) True b) False

17) Wave analyser gives only the reading of the amplitude of the chosen frequency component.
a) True b) False

18) Both oscilloscope and spectrum analyser display the received signal strength on the y-axis
a) True b) False

19) Through CRT mechanism, electrons are emitted and controlled to form the desired signal image on the fluorescent screen
a) True b) False

20) The synchronization condition in CRO is that the sweep signal frequency is an integral multiple of the input signal frequency.
a) True b) False

21) During the sweep time, in CRO, the electron beam moves from right to left across the CRT screen.
a) True b) False

22) Ordinary oscilloscopes are unsatisfactory in the cases of transient and very high frequency signals
a) True b) False

23) Bistable storage CRT has two write guns and one flood gun
a) True b) False

24) In DSO the stored display can be displayed indefinitely long as the power is applied to the memory
a) True b) False

25) Random errors remain constant or change according to a definite law on repeated measurements of the given quantity.
a) True b) False

22) In ----- probe, compensation is included for oscilloscope input capacitance and coaxial cable capacitance.
(a) attenuator (b) active.
(c) normal. (d) passive.

23) In normal probe at frequencies at which the capacitive reactance equals Rs, there is ---- in the displayed signal.
(a) attenuation (b) phase shift.
(c) both (a) and (b) (d) Neither (a) nor (b)

24) -------- errors change with time in an unpredictable manner; however, it can be reduced by taking certain precautions.
a) random. b) environmental.
c) gross. d) instrumental.

25) Light dependent resistor is classified as --------
a) a thermistor b) an actuator.
c) a thermocouple. d) a sensor.

Question (2) Choose True or False

1) Resolution is expressed as an accrual value or as a fraction or percentage of the full scale value.
a) True b) False

2) Quality factor of a coil, dissipation factor of a capacitor can be measured using DC bridges
a) True b) False

3) Frequency can be measured using De Sauty's bridge
a) True b) False

4) DC bridges are used to determine the conductance associated with conducting wires
a) True b) False

5) Bridge circuits are analogous to difference amplifiers.
a) True b) False

6) A loss less inductor would have zero Q-factor at all frequencies.
a) True b) False

7) In LVDT the two secondary windings have different number of turns
a) True b) False

8) Sensor is a term collectively used for both transducers and actuators
a) True b) False

9) Friction effect is maximum in electrical transducer.
a) True b) False

10) Generally, a mechanical device acts as a primary transducer and electrical device acts as a secondary transducer.
a) True b) False

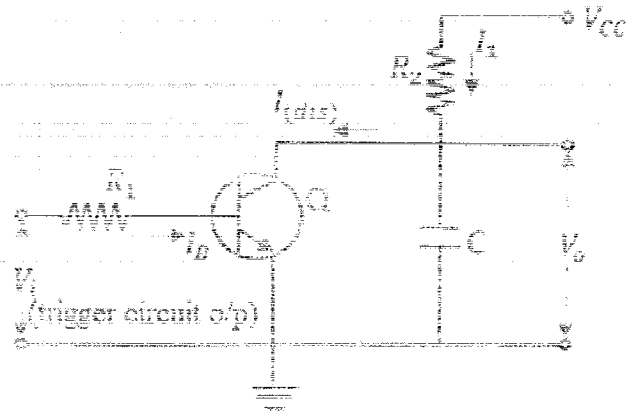


Figure (B)

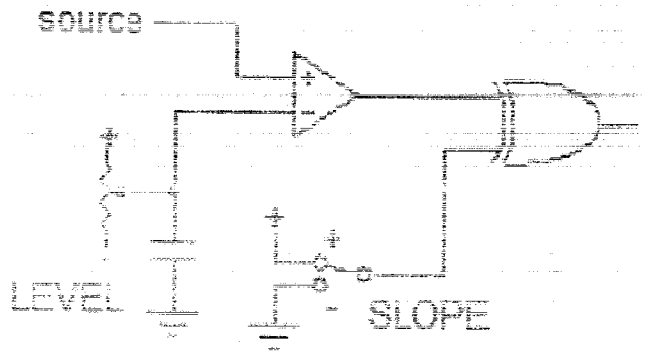


Figure (C)

With Best Wishes

Question (3) Complete the missing words.

(1) Figure (A) represents the block diagram of ------. Block (a) is ------, block (b) is ------, block (c) is --------, block (d) is --------, and block (e) is ---------.

(2) Errors which occur in measurements due to parasitic values, temperature effects, errors due to improper grounding and shielding can be eliminated using ----------.

(3) The circuits in figures (D) and (C) represent -------- and ---------.

(4) The purpose of Aquadag coating in CRT is -------- and --------.

(5) Applications of wave analysers inonge -------, -------, and --------- measurements.

(6) The input of the trigger circuit in CRT can be ---- or ---- or ------.

(7) Analog storage Oscilloscope uses special types of CRT -------- and -------- storage CRTs.

(8) In the case of an AC bridge, arm AB has a resistance in parallel with a capacitor. The values are $R1 = 1.2$ kΩ, $C1 = 0.25$ μF. Arm BC has a resistance in series with a capacitor with values of $R2 = 1.0$ kΩ, $C2 = 0.5$ μF. Arm CD is a pure resistance arm with $R3 = 2$ kΩ. Determine the values of the components in arm DA if the bridge is balanced at a frequency of 500 Hz.

(9) A 3 V signal with a source resistance of $R_s = 600$ Ω is connected to an oscilloscope which has an input impedance of $R_i = 1$ MΩ in parallel with $C_i = 30$ pF. The coaxial cable has a capacitance of $C_{cable} = 100$ pF. Calculate the oscilloscope terminal voltage (V_i) when the signal frequency is 100 Hz. Also determine the frequency at which V_i is 3 dB below V_s.

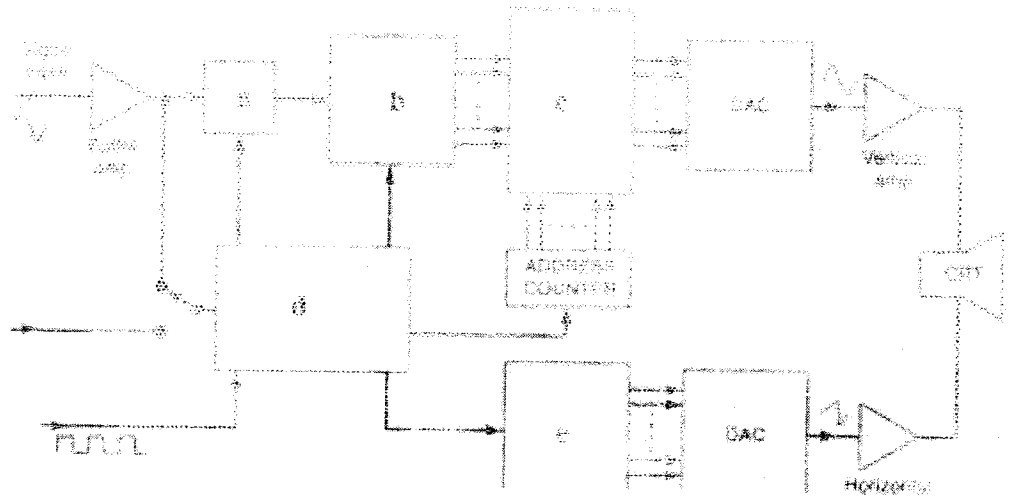


Figure (A)