

Section I**All questions are compulsory****(40 x 1 = 40 marks)**

- 1 The size and shape of the focal spot are determined by the size and the shape of the electron stream when it hits the _____
 - a) Anode
 - b) Cathode
 - c) Filament
 - d) target

- 2 If the energy of the X-ray photon is 130 KeV, then what will be its wavelength
 - a) 0.08 \AA
 - b) 1.30 \AA
 - c) 0.095 \AA
 - d) 0.2 \AA

- 3 Wavelength of ultrasound waves is _____
 - a) More than audible sound
 - b) Less than audible sound
 - c) Equal to audible sound
 - d) Greater than light wave

- 4 Doppler shift is caused due to _____
 - a) WBC
 - b) Platelets
 - c) Plasma
 - d) RBC

- 5 Pre amplifier isolation in ECG circuit is to _____
 - a) Increase input impedance
 - b) Decrease input impedance
 - c) Increase output impedance
 - d) Decrease output impedance

- 6 Alzheimer's disease in human is associated with deficiency of _____
 - a) Dopamine
 - b) Glutamic acid
 - c) Acetylcholine
 - d) Gamma Amino-butyric acid

- 7 In the resting state of neural membrane, diffusion due to concentration gradient, if allowed would drive _____

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- a) K^+ into cell
b) K^+ and Na^+ out of cell
c) Na^+ into cell
d) Na^+ out of cell
- 8 _____ is an electrical pulse generator that start or maintain normal heart rhythm
- a) Defibrillator
b) Pacemaker
c) Haemodialysis
d) None of above
- 9 The graph record of heart sounds is called _____
- a) Phonocardiogram
b) Photoplethysmography
c) Haemodialysis
d) Stethoscopy
- 10 In bradycardia, the heart rate of patient is _____
- a) below 60
b) below 80
c) below 100
d) above 120
- 11 Which of the following is usually the dominant natural pacemaker & fires the fastest
- a) SA node
b) AV node
c) His bundle
d) Purkinje fibre
- 12 With the differential gain of 50,000 and common mode gain of 2, what is common mode rejection ratio?
- a) -87.9db
b) -43.9db
c) 43.9db
d) 87.9db
- 13 If feedback input resistor ratio of a feedback amplifier is 4.6 with 1.7V applied to non-inverting input. What is the output value?
- a) 7.82 V
b) 6.43 V
c) 8.52 V
d) 9.52 V

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- 14 Interactions that produce X-rays in the anode include
1. Coherent
 2. Compton
 3. Bremsstrahlung
 4. Pair production
 5. Characteristic
- a) 1, 3 and 5
b) 2 and 4
c) 3 and 5
d) 1, 2, 3, 4 and 5
- 15 X-rays with high _____ are called hard X-rays
- a) Scattered radiations
 - b) Primary radiations
 - c) Wavelength
 - d) Photon energy
- 16 The imaging techniques which uses X-rays are
- a) Mammography
 - b) Fluoroscopy
 - c) Computed Tomography
 - d) Positron Emission Tomography
- 17 Which dietary mineral must be limited for a person undergoing hemodialysis?
- a) Potassium
 - b) Iron
 - c) Zinc
 - d) Molybdenum
- 18 What will be the intensity of incident X-ray photons if the number of photons transmitted is 800 when it strikes 1 cm thickness of water with the attenuation coefficient at 0.22 cm^{-1} .
- a) 1000
 - b) 600
 - c) 997
 - d) 800
- 19 What is saccade eye movement?
- a) The rapid shifting of eyes to take in interesting points
 - b) The way eyes see colour
 - c) The use of the eyes to take in light
 - d) The process of transferring information from the eyes to the brain

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- 20 Thermoregulatory system in humans is maintained by
- Hypothalamus
 - Thyroid
 - Pituitary
 - Adrenal
- 21 What is the CT number of cartilage whose attenuation coefficient is 0.3 cm^{-1} and attenuation coefficient of water is 0.19 ? (Magnification Constant 1000)
- 366 HU
 - 579 HU
 - 24 HU
 - 1579 HU
- 22 _____ is synthesized in the liver and it is essential for blood coagulation.
- Plasma
 - Fibrinogen
 - Platelets
 - Antibodies
- 23 Blood group 'O' has
- Neither 'A' nor 'B' antigen
 - Antigen 'A' & 'B'
 - Antigen 'B'
 - Antigen 'A'
- 24 Haemoglobin is large complex protein containing _____ protein and _____ ion containing complex called as Haem.
- Globular & Saturated
 - Albular & Saturated
 - Globular & Pigmented
 - Albular & Pigmented
- 25 Blood group is composed of straw-coloured transparent fluid.
- Globulin
 - Nutrients
 - Plasma
 - Inorganic salts
- 26 The maximum amplitude of FECG recorded during pregnancy [R wave] is about ____
- 10 – 30 microV
 - 100-300 microV
 - 1-3mV
 - 5-8mV

- 27 The lifespan of RBCs is ____
- 10 days
 - 50 days
 - 100 days
 - 120 days
- 28 Incubators has a canopy/ hood made of ____ material
- Fibre glass
 - Acrylic glass
 - Plexiglass
 - All of the above
- 29 What is the value of steady state error in closed loop control system?
- 0
 - Unity
 - Infinity
 - Unpredictable
- 30 What is the resonance frequency of the 1H in the magnetic field of 2T. The gyromagnetic ratio is 42.58 MHz/T?
- 85.16 MHz
 - 22.54 MHz
 - 16.34 MHz
 - 42.58 MHz
- 31 The open loop transfer function of an unity feedback open loop system $\frac{2s^2+6s+5}{(s+1)^2(s+2)}$
- $2s^2+6s+5=0$
 - $(s+1)^2+(s+2)=0$ $(1+GH)=0$
 - $2s^2+6s+5+(s+1)^2(s+2)=0$
 - $2s^2+6s+5-(s+1)^2(s+2)=0$
- 32 Major application of contrast enhancement radiography is in _____
- Industry
 - Astronomical observations
 - Angiography
 - Lithography
- 33 Pressure transducer for measuring blood pressure is ____
- Strain gauge transducer only
 - Strain gauge or capacitive transducer
 - Resistive transducer
 - Fiber optic transducer

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- 34 The instrument used for measurement of pressure is ____
- Bellows
 - Diaphragms
 - Fiber optic pressure sensor
 - All of the above
- 35 Artificial Kidney Dialyser works on the principle of:
- Newton's first law
 - Fick's law of diffusion
 - Ohm's law
 - None of the above
- 36 PACS system works on which _____ Medical Data Standards
- Digital Communication and Imaging standard in Medicine
 - Digital Imaging and Communication in Medicine
 - Joint Photographic Expert group in Medicine
 - Digital standard for Medical Imaging
- 37 For a continuous time signal $x(t)$ should be periodic with period T , then $x(t+mT)$ should be equal to
- $x(-t)$
 - $x(mT)$
 - $x(mt)$
 - $x(t)$
- 38 $\{x(n)*h_1(n)\}*h_2(n)=x(n)*\{h_1(n)*h_2(n)\}$ gives the property of
- Commutative
 - Distributive
 - Associative
 - Invertibility
- 39 The number of roots of $\frac{s^3+6s+5}{(s+1)^2(s+2)}$
The characteristic equation of closed loop system is
- $2s^2+6s+5$
 - $(s+1)^2(s+2)=0$
 - $2s^2+6s+5+(s+1)^2(s+2)$
 - $2s^2+6s+5-(s+1)^2(s+2)$
- 40 In order to select a slice for excitation, the MR scanner,
- Tunes the frequency of the excitation pulse
 - Tunes the phase of the excitation pulse
 - Tunes the magnetic field of the excitation pulse
 - Tunes the spacing between the excitation and refocusing (180-degree) pulses

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Section II

Attempt any three (03) questions out of five (05)

(3 x 10 = 30 marks)

- Q1. What are the requirements of amplifiers used in biomedical recorders?
- Q2. Explain the basic block diagram of EMG machine.
- Q3. Explain with neat sketch anatomy and conducting system of heart.
- Q4. Discuss in detail about action potential and resting potential with diagrams.
- Q5. List the precautionary measures taken for MRI scan.

Section III

Attempt any two (02) questions out of four (04)

(2 x 15 = 30 marks)

- Q1. Explain the four generations of CT scanners.
 - Q2. Explain the working principle of single channel telemetry system with a neat block diagram.
 - Q3. Explain the principle of working of Spiral CT machine and state its advantages over conventional CT machine
 - Q4. Explain the working of a DC defibrillator with a neat block diagram.
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