ALIAH UNIVERSITY
Paper Name: BIOLOGY FOR ENGINEERS
Paper Code: BIOUGBS01
2022

Marks-80 **Time-3Hrs**

A. Answer the following question with select the correct options. **1×45=45**

1. The canal system is characteristic feature of
(A)Arthropods
(B)Mollusca
(C)sponges
(D)echinoderms

2. Cistron is
(A) The coding sequence of DNA
(B) The functional unit of DNA molecule that codes for a particular gene product
(C) Intervening non coding sequence of DNA
(D) The sequences which are removed during RNA splicing.

3. This is the largest phylum of Animal on the earth.
(A)Mollusca
(B) Amphibia
(C) Arthropoda
(D) Aves

4. The jawless vertebrate is
(A) crocodile
(B) zoris
(C) *Hyla*
(D) *Petromyzon*

5. Ribosomes are made up of
(A)RNA only
(B)RNA andProteins
(C)RNA, DNAand Proteins
(D)nucleic acids,proteinsandlipids

6. Which of the following snake is non-poisonous?
(A) cobra
(B) krait
(C) viper
(D) python

7.Which of the following is the function of lysosomes?
(A)autophagy
(B)autolysis
(C) digestion
(D) alloftheabove

8. Phylum of *Taenia Solium* is
(A) Aschelminthes
(B)Annelids
(C) Platylyelminthes
(D) mollusca

9. Where is DNA present in the eukaryotic cells?
(A)Inside the nucleus
(B) With other cellular contents
(C) Inside the ribosomes
(D) Not present

10. Which of the following nitrogenous base is not present in DNA?
(A) Thymine
(B) Adenine
(C) Guanine
(D) Uracil

11. The bases are held together in a DNA double helix by hydrogen bonds. These bonds are
(A) Ionic bonds
(B) Covalent bonds
(C) Non-covalent bonds
(D) Van der Waals forces

12. In a fetus, where are lymphocytes produced?
(A) In the spleen
(B)In the bone marrow
(C)In the liver
(D)In the heart

13. Anticodon is present in
(A) DNA
(B) tRNA
(C) rRNA
(D) mRNA

14. Name the secondary structure of tRNA?
(A) Cloverleaf
(B) L-shaped
(C) Duplex
(D) Triple Helix

15. Glycolysis is the conversion of
(A) Fructose into phosphoenolpyruvate
(B) Fructose into pyruvate
(C) Glucose into phosphoenolpyruvate
(D) Glucose into pyruvate

16. Which of the following rRNA molecules have peptidyl transferase activity in prokaryotes?
(A) 23S rRNA
(B) 28S rRNA

(C) 5S Rrna
(D) 18S rRNA

17. The percentage of human genome which encodes proteins is approximately
(A)Less than 2%
(B)5%
(C)25%
(D)99%

18. In EMP pathway, the process by which ATP is formed from ADP is
(A) reduction
(B) oxidative phosphorylation
(C) substrate-level phosphorylation
(D) photo phosphorylation

19. Sickle cell anemia is caused
(A) When valine is replaced by glutamic acid in beta polypeptide chain
(B) When glutamic acid is replaced by valine in beta polypeptide chain
(C) When glutamic acid is replaced by valine in alpha polypeptide chain
(D)When valine is replaced by glutamic acid in alpha polypeptide chain

20. In prokaryotic cells, ribosomes are
(A) 70 S
(B) 80 S
(C) 60S + 40S
(D) 50S + 40S

21. Which of these is a characteristic of prokaryotic cells?
(A) Absence of cell organelles
(B) Absence of nucleus
(C) Presence of 70S ribosomes
(D) All of these

22. In prokaryotes, the hair-like outgrowths which attach to the surface of other bacterial cells are
(A) Flagella
(B) Pili
(C) Capsule
(D) Plasmids

23. B-cells and T-cells are two types of cells involved in _____
(A) Innate Immunity
(B) Active immunity
(C) Passive immunity
(D) Acquired immunity

24. Whocoinedthetermmitochondria?
(A)Kolliker
(B)Benda
(C)Fleenming
(D)Robert Brown

25. On the Origin of Species was written by _____
(A) Charles Darwin
(B) Ludmila Kuprianova
(C) Mikhail A. Fedonkin
(D) None of the above

26. Which of the following cells of the immune system do not perform phagocytosis?
(A) Macrophage
(B) Neutrophil
(C) Eosinophil
(D) Basophil

27. The force that initiates evolution is _____
(A) Variation
(B) Mutation
(C) Extinction
(D) Adaptation

28. The limbless amphibian is
(A)*Ictthyophis*
(B) *Hyla*
(C) *Rana*
(D) *Salamander*

29. The EMP pathway in eukaryotes usually takes place in
(A) nucleus
(B) lysosome
(C) Golgi apparatus
(D) cytosol

30. What is the first step in the payoff phase of glycolysis?
(A) Reduction of 1, 3-bisphosphoglycerate to glyceraldehyde 3-phosphate
(B) Oxidation of glyceraldehyde 3-phosphate to 1, 3-bisphosphoglycerate
(C) Reversible conversion of dihydroxyacetone phosphate to glyceraldehyde 3-phosphate
(D) Irreversible conversion of dihydroxyacetone phosphate to glyceraldehyde 3-phosphate

31. Plasmamembrane is
(A)Permeable
(B)Selectivelypermeable
(C)Impermeable
(D)Semi-permeable

32. In mitochondria cristae act as sites for
(A) proteinsynthesis
(B) phosphorylation of flavoproteins
(C) breakdown of macromolecules
(D) Oxidation–reductionreaction

33. Which of the following statements is true regarding the "law of segregation"?
(A) Law of segregation is the law of purity of genes
(B) Alleles separate from each other during gametogenesis
(C) Segregation of factors is due to the segregation of chromosomes during meiosis
(D) All of the above

34. How many phenotypes can occur in the human blood group ABO with alleles $I^A I^B i$?
(A) 2
(B) 3
(C) 4
(D) 1

35. Cystic fibrosis is
(A) Sex-linked recessive disorder
(B) Autosomal dominant disorder
(C) Autosomal recessive disorder
(D) Sex-linked dominant disorder

36. Alleles are
(A) Alternate forms of genes
(B) Linked genes
(C) Chromosomes that have crossed over
(D) Homologous chromosomes

37. The experiment that simulated conditions thought to be present on the early earth
(A) Hershey–Chase experiment
(B) Geiger–Marsden experiment
(C) Miller–Urey experiment
(D) Schiehallion experiment

38. Observation of species on _____ heavily inspired Darwin's theory of evolution.
(A) Ilha da Queimada Grande
(B) Guatemala
(C) Faroe Islands
(D) Galapagos Islands

39. Mammal's heart is
(A)Myogenic
(B) neurogenic
(C) voluntary
(D) sympathetic

40. What is the full form of PPLO?
(A) Pleural Parasite Like Organisms
(B) Phosphatic Pneumonia Like Organisms
(C) Pleuro Parasite Like Organisms
(D) Pleuro Pneumonia Like Organisms

41. Which of the following cells is involved in humoral immunity?
(A) T-cells
(B) B-cells
(C) Mast cells
(D) Both T and B cells

42. Body cavity lined by mesoderm is called

(A) coelenteron
(B) pseudocoel
(C) coelom
(D) blastocoel

43. Which of the following components of the vertebrate immune response occurs first upon invasion by a virus or bacterium?

(A)Activation of killer T lymphocytes
(B)Activation of B lymphocytes N
(C)The inflammatory response
(D)Mobilization of complement proteins

44. Tube feet are the locomotory organs of

(A) platyhelminthes
(B) Echinodermata
(C) Mollusca
(D) Arthropoda

45. Which of the following organelle is called 'Suicidal Bag'?
(A) Mitochondria
(B) Endoplasmicreticulum
(C) Lysosome
(D) Ribosome

B. Answer any 10 questions from the following. **2×10=20**

1. What is pseudocoelom? Where is it found?
2. What is Nucleotide?
3. In which cell organelle cristae is found? Mention its one function.
4. Mention two differences between Adaptive Immunity and Innate Immunity.
5. Write down the two characteristics features of Phylum Mollusca.
6. What do you mean by EMP pathway?
7. What is Central Dogma in molecular biology?
8. Mention one prokaryotic cell and one eukaryotic cell name.
9. What is tRNA? Mention its one function.
10. What is Nephridia? Where it is found?
11. What do you mean by allele?
12. What is Codon?

C. Answer any 3 questions from the following. 5×3=15

1. Describe the structure of DNA with suitable diagram.
2. What is Glycolysis? Write down the steps of Glycolysis.
3. Write down the short note on B-cell and T-cell.
4. Write down the characteristics features of Phylum Echinodermata. Mention two animal name under this phylum.

ALIAH UNIVERSITY

End-Semester Examination - Spring 2022
(B.Tech ECE 2nd Yr-4th Semester)
Subject Name: Computer Organization
Subject Code: CSEUGOE02

Full Marks- 80 Time-3hrs.

Group-A

Answer any seven questions **7×5=35**

(1) Write the minimum and maximum representable ranges of signed magnitude, signed 1's complement and signed 2's complement representation with n-bits. Discuss the representation of 0 (zero) in both signed 1's complement and signed 2's complement method and justify which representation technique the computer system uses for arithmetic operations and why.

(3+2)=5

(2) Write the name(s) of the instruction format which uses general register-based CPU organization? Let $X = (A + B) * (C - D + E/F)$, perform the operations using zero address instruction format.

(1+4)=5

(3) Perform the following conversion/ arithmetic operation:

(a) $(1011011)_2=(?)_{BCD}$ (b) $(1010110)_2 + (1101011)_2 + (1011011)_2$

(c) $(C9D.1E)_{16} =(?)_8$ (d) $(-29)_{10} + (-23)_{10}$ using signed 2's complement method.

(1+1+1+2)=5

(4) Discuss about logical instructions of 8085 microprocessor.

5

(5) Differentiate between SRAM and DRAM. Discuss about memory hierarchy.

(2+3)=5

(6) A four stage pipeline has the stage delays as 150, 120, 160 and 140 ns respectively. Registers are used between the stages and have a delay of 5 ns each. Assuming constant clocking rate, find the total time taken to process 1000 data items on the pipeline.

5

(7) Explain the terms *Speedup*, *Efficiency* and *Throughput* of a pipeline processor. What will be the speed up for a 4 segment linear pipeline when the number of instruction n=64?

(3+2)=5

(8) Describe data bus, address bus, and control bus with proper diagram.

5

Group-B

Answer any three questions **3×15=45**

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(9)

(a) Find the effective access time when cache hit ratio h, cache hit time $t_c\ ns$ $(nano\ second)$, and main memory hit time $t_m\ ns$.

(b) Consider a 4-way set associative mapped cache. The size of main memory is 64 MB and there are 10 bits in the tag. Find the size of cache memory.

(c) Let main memory size is 64GB, cache memory size is 16MB and block size is 4KB. Find tag bits and tag directory size using both direct cache mapping and Associative cache mapping.

(3+6+6)=15

(10). (a) Represent $(-45.75)_{10}$ in IEEE single precision format.

(b) Consider the following representation of a number in IEEE 754 single-precision floating point format with a bias of 127.

S:1
E:10000001
F:11110000000000000000000

Here, S, E and F denote the sign, exponent, and fraction components of the floating point representation. Find the decimal value corresponding to the above representation (rounded to 2 decimal places).

(c) Add 1.0100110×2^3 with 1.1001011×2^2

(6+5+4)=15

(11). (a) Find a, b, c from the relation $(11)_2 + (22)_3 + (33)_4 + (44)_5 = (abc)_6$

(b) Find the value of a, b if $(a\ 5\ 6\ 7)_8 + (2\ b\ a\ 5)_8 = (7\ 1\ b\ a)_8$

(c) Find the possible values of 'x' and 'y' from the relation $(42)_9 = (x3)_y$

(5+5+5)=15

(12) Explain Booth's algorithm with proper diagram for its working principle. Write an advantage and a disadvantage of Booth's algorithm. Perform (-19)*(-29) using Booth's Algorithm.

(5+2+8)=15

B. Tech Examination-2022
Electronics and Communication Engineering
(Even Semester Regular and Supplementary)
Principle of Communication System (ECEUGOE02)

Full Marks: 80 Time: 3.00 Hrs

- ***Answer Q.1 and seven question from rest of the question***.
- *Answer all parts of a question in same place.*
- *Figures on the right-hand side margin indicate full marks.*
- *Symbols have their usual meaning*

1. Choose the correct alternative from the given options. **10**

(a) The function of the input transducer in a communication system is – i) to transmit the message signal ii) to modulate the message signal iii) to convert message sound signal into electrical signal iv) none of the above

(b) If the radiated power of AM transmitter is 10 KW, the power in the carrier signal for modulation index of 0.6 is nearly – i) 8.24 KW ii) 8.47 KW iii) 9.26 KW iv) 9.6 KW

(c) A 1000 KHz carrier is simultaneously amplitude modulated with 300 Hz and 2 KHz audio sine wave. The frequency which will not present in the output is -i) 998 KHz ii) 999.7 KHz iii) 1000.3 KHz iv) 700 KHz

(d) In commercial FM broadcasting the maximum frequency deviation is normally -i) 5 KHz ii) 15 KHz iii) 75 KHz iv) 200 KHz

(e) Pre-emphasis in FM systems involves - a) compression of modulating signal b) expansion of modulating signal c) amplification of lower frequency components of the modulating signal d) amplification of higher frequency components of the modulating signal

(f) If a signal band-limited to f_m Hz is sampled at a rate less than $2f_m$ the reconstructed signal will be –i) higher in magnitude ii) smaller in magnitude iii) have higher frequency suppressed iv) distorted.

(g) Companding is used in PCM to – i) improve signal to noise ratio for low level input signal ii) reduce the probability of error iii) reduce quantizing noise iv) to increase signal strength.

(h) In a DM system the granular noise occurs when the modulating signal - i) increases rapidly ii) changes very slowly iii) decreases rapidly iv) the nature of modulating signal has nothing to do with the noise.

(i) How many bits would be required to represent 256 quantization levels in PCM? – i) 6 ii) 8 iii) 5 iv) 7.

(j) Which modulation technique is known as ON-OFF keying – i) ASK ii) FSK iii) PSK iv) DPSK

2. (a) Draw the block diagram of a communication system and briefly explain the function of each block. 5

(b) What is baseband transmission? 2

(c) Explain the needs of modulation in communication system. 3

3. (a) What is meant by amplitude modulation? 2

(b) Define the term modulation index for AM. 2

(c) Derive an expression for single tone amplitude modulated wave. 4

(d) Draw the waveform of over modulated AM wave and write the condition for over modulation. 2

4. (a) Describe the generation of AM signal using square law diode modulation technique 5

	(b)	How is a DSB-SC signal demodulated?	3
	(c)	Calculate the percentage of power saving for DSB-SC signal for percentage modulation of 50 %.	2
5.	**(a)**	What do you mean by frequency deviation and carrier swing?	2
	(b)	Derive an expression for single tone narrow band FM signal.	4
	(c)	A single tone frequency modulated wave is denoted by following expression $s(t) = 12\cos[6\times10^8 t + 5\sin(1250t)]$. Determine carrier frequency, modulating frequency, modulation index and maximum frequency deviation	4
6.	**(a)**	Explain the varactor diode method for generation of FM signal.	5
	(b)	What are the drawbacks of direct method for FM generation?	2
	(c)	Explain Pre-Emphasis in FM signal generation.	3
7.	**(a)**	State sampling theorem.	2
	(b)	What is aliasing? How is it prevented?	2
	(c)	Explain ideal sampling technique.	4
	(d)	Find the Nyquist rate and the Nyquist interval for the signal $x(t)=\cos(4000\pi t)\cos(1000\pi t)$	2
8.	**(a)**	Explain the operation of a PCM transmitter with suitable block diagram.	5
	(b)	Derive the expression for transmission bandwidth in a PCM system.	3
	(c)	A television signal having a bandwidth of 4.2 MHz is transmitted using binary PCM system. Given that number of quantization level is 512. Determine transmission bandwidth and output signal to quantization noise ratio.	2
9.	**(a)**	Explain Delta modulation in detail with suitable block diagram.	4
	(b)	What are slope overload distortion and granular noise in delta modulation and how it is removed in ADM?	3
	(c)	Given a sine wave of frequency f_m and amplitude A_m applied to a delta modulator having a step size Δ. Show that slope overload distortion will occur if $A_m > \Delta/(2\pi f_m T_s)$, Here T_s is the sampling frequency	3
10.	**(a)**	What are the desirable properties of line code?	3
	(b)	The binary data 10101001 is transmitted over a baseband channel. Draw the waveform for the transmitted data using following format. i) Polar RZ ii) Split phase Manchester coding. iii) AMI iv) Polar Quaternary NRZ signaling.	4
	(c)	A digital data 10101101 is transmitted using digital modulation techniques. Draw the waveform of ASK signal, FSK signal, PSK signal corresponding to the given digital data.	3
11.	**(a)**	What do you mean by entropy?	2
	(b)	A discrete memoryless source (DMS) X has five possible outcomes with probabilities $P_1=1/2$, $P_2=1/4$, $P_3=1/8$, $P_4=1/16$, $P_5=1/16$. Find entropy and information rate if there are 16 outcomes per second.	4
	(c)	Determine the Huffman code for the following messages with their probabilities given.	

X_1	X_2	X_3	X_4	X_5	X_6	
0.3	0.25	0.2	0.12	0.08	0.05	4

-End-

B.Tech. Examination-2022

Electronics and Communication Engineering
(Even Semester Regular and Supplementary)
Digital Electronics and Logic Design (PCC ECEUGPC05)

Full Marks : 80 **Time-3 hrs**

(Answer Question no. 1 and any four from the rest)

1. (a) The Boolean function $Y = AB + CD$ is to be realized using only two-input NAND gates. The minimum number of gates required is
(i) 2 (ii) 3 (iii) 4 (iv) 5

(b) The point P in the Fig. 2 is stuck at '1'. The output f will be: (i) $\overline{AB\bar{C}}$ (ii) $\bar{A}$ (iii) $AB\bar{C}$ (iv) A

(c) Express the Boolean function F in sum-of-products form in Fig. 3 (with proper reasoning).

(d) The binary values applied as X=1, Y=1 ; X=0, Y=0 in Fig. 4. What will be the corresponding stable P, Q outputs (with proper reasoning) ?

(e) Decimal 43 in hexadecimal and BCD number system is respectively (with proper reasoning) :
(i) B2, 01000011 (ii) 2B, 01000011 (iii) 2B, 00110100 (iv) B2, 01000100

(f) The Boolean expression $(X + Y)(X + \bar{Y}) + \overline{(\overline{X}\ \overline{Y})} + \overline{X}$ simplifies to
(i) X (ii) Y (iii) XY (iv) X+Y

(g) If the input to the digital circuit in Fig. 1 consisting of a cascade of 20 XOR gates is X, then the output Y is equal to
(i) 0 (ii) 1 (iii) $\overline{X}$ (iv) X (2+6×3=20)

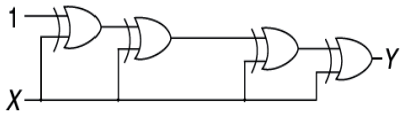


Fig. 1

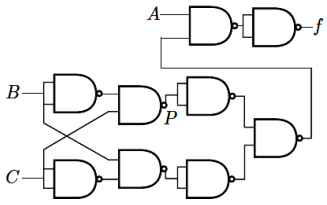


Fig. 2

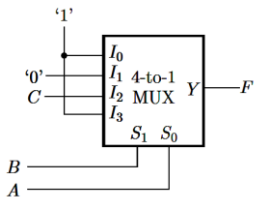


Fig. 3

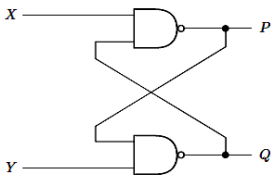


Fig. 4

2. (i) Prove the following theorems of Boolean algebra with algebraic methods only :-
(a) $x\bar{y} + y = x + y$ (b) $zx + z\bar{x}y = zx + zy$ (c) $\overline{x_1 + x_2 + x_3 + \cdots + x_n} = \overline{x_1}\ \overline{x_2}\ \overline{x_3} \ldots \overline{x_n}$

(ii) Simplify the Boolean expressions to minimum number of literals:-
(a) $(A + B)(\bar{A}\bar{C} + C)\ \overline{\bar{B} + AC}$ (b) $(A + C + D)(A + C + \bar{D})(A + C + D)(A + \bar{B})$ (2+4+4)+(3+2)

3. (i) Show that $\overline{x \oplus y} = x \odot y$.

(ii) Given the Boolean function : $F = \bar{A}B + A\bar{B}$; Implement 'F' with minimum number of AND and NOT gates only.

(iii) Show that NAND gate is an universal logic element. (5+5+5)

4. (i) Simplify the following Boolean function in sum of products form using K-map method :-

$$F = \bar{A}\bar{B}\bar{D} + A\bar{B}C\bar{D} + \bar{A}BD + AB\bar{C}D$$

(ii) Implement the following Boolean function in product of sums form and implement it with only four NOR gates. Only normal inputs are available.

$$F = \bar{w}xz + \bar{w}yz + \bar{x}y\bar{z} + wx\bar{y}z \quad ; \quad d = wyz$$ 5+(5+5)

5. (i) Explain the operation of 4-bit binary parallel adder/subtractor.
(ii) Implement a full-adder circuit with a 3 × 8 decoder and two OR gates.
(iii) Implement the following function $F = x'y' + xyz'$, with a decoder and OR gate. 5+(5+5)

6. (i) Implement 8 × 1 MUX with two 4 × 1 MUX and OR gate.
(ii) Implement the following function with a multiplexer :

$$F(A, B, C, D) = \sum(0,1,2,4,9,11,15)$$ (7+8)

7. (i) Draw and explain the operation of mod-8 ripple counter with output timing waveforms.
(ii) Design a mod-3 counter with counting states 00, 10, 11, 00. (2+3+4+6)

8. (i) Realize JK flip-flop from SR flip-flop and verify its truth table.
(ii) Convert JK flip-flop into D flip-flop and T flip-flop. (2+6+4+3)

9. (i) With suitable logic diagram explain the operation of mod-4 ring counter.
(ii) Explain the operation of 4-bit shift register with timing waveform. (3+5+3+4)

B. Tech Examination-2022
Electronics and Communication Engineering
(Even Semester Regular and Supplementary)
Electromagnetic Engineering (ECEUGPC06)

Full Marks: 80 Time: 3.00 Hrs

- ***Answer Q.1 and seven questions from rest of the questions.***
- *Answer all parts of a question in same place.*
- *Figures on the right-hand side margin indicate full marks.*
- *Symbols have their usual meaning*

1. Choose the correct alternative from the given options. 10

(a) A transmission line is said to be distortion less line when-i) R/L=G/C ii) R/G=C/L iii) RG=L/C iv) R/G=LC

(b) One of the following is not a source of magnetostatic fields: i) a DC current in a wire ii) a permanentt magnet iii) an accelerated charge iv) an electric field linearly changing with time.

(c) The intrinsic wave impedance of a medium with permeability μ and permittivity ε is - i) $\sqrt{\mu/\varepsilon}$ ii) $\sqrt{\varepsilon/\mu}$ iii) $\sqrt{1/\mu\varepsilon}$ iv) $\sqrt{\mu\varepsilon}$

(d) Poynting vector for EM wave has unit – i) Watt/m ii) Watt/m^2 iii) Watt^2/m iv) (Watt/m)^2

(e) The direction of propagation of electromagnetic wave is obtained from – i) **E**x**H** ii) **E**-**H** iii) **E** iv) **E**/**H**

(f) Electric field intensity is – i) scalar ii) vector iii) both scalar and vector iv) none of the option given

(g) The magnetic flux density **B** and vector potential **A** are related as – i) $\mathbf{B}=\nabla \times \mathbf{A}$ ii) $\mathbf{A}=\nabla \times \mathbf{B}$ iii) $\mathbf{B}=\nabla . \mathbf{A}$ iv) $\mathbf{A}=\nabla . \mathbf{B}$

(h) Antenna is a – i) transducer ii) non-radiating elements iii) amplifier iv) none of this

(i) Which of the following is not a Maxwell's equation – i) $\mathbf{D}=\varepsilon\mathbf{E}$ ii) $\nabla . \mathbf{D}=\rho$ iii) $\nabla X\mathbf{E}=-\partial\mathbf{B}/\partial t$ iv) $\nabla X\mathbf{H}=\mathbf{J}+\partial\mathbf{D}/\partial t$

(j) The intrinsic impedance of free space is given by – i) 333Ω ii) 377Ω iii) 233.5 Ω iv) none of this.

2. (a) State Divergence theorem and Stoke's theorem. 4

(b) Use the cylindrical coordinate system to find the area of a curved surface on the right of a circular cylinder having radius = 3 m, height = 6 m, and $30^0 \le \Phi \le 120^0$ 4

(c) Find the nature of the field by determining the divergence and curl.
$F_1=30\mathbf{a}_x+2xy\mathbf{a}_y+5xz^2\mathbf{a}_z$ 2

3. (a) State Coulomb's Law. 2

(b) What is meant by electric field intensity at a point? 2

(c) Define electric flux and flux density. 2

(d) Find the force on a point charge q located at (0, 0, h) m due to charge of surface charge density ρ_s C/m^2 uniformly distributed over the circular disc $r \le a$, $z=0$ m. 4

4. (a) State and prove the Gauss's Law. 4

(b) Derive the equation of continuity $\partial\rho_v/\partial t+\nabla . \mathbf{J}=0$ 3

(c) Let $\mathbf{D}=2y^2z^2\mathbf{a}_x+3xy^2z^2\mathbf{a}_y+2xyz\mathbf{a}_z$ pC/m^2 in free space. Find (i) the total electric flux passing through the surface $x=2$, $0 \le y \le 2$ and $0 \le z \le 2$ in a direction away from the origin. (ii) the total charge contained in an incremental sphere of radius 1 μm centered at P (2,2,2). 3

5. (a) Define electric potential. 2

(b) Show that in the presence of the surface charge at the boundary between two perfects dielectrics the normal component of the electric flux density is discontinuous. 4

(c) A boundary exists at z=0 between two dielectrics ε_{r1}=2.5 in region z<0 and ε_{r2}=4 in region z >0. The field in region of ε_{r1} is $\mathbf{E}_1$=-30$\mathbf{a}_x$+50$\mathbf{a}_y$+70$\mathbf{a}_z$ V/m**.** Find i) normal component of $\mathbf{E}_1$ ii) tangential component of $\mathbf{E}_1$ iii) normal component of $\mathbf{D}_2$ iv) tangential component of $\mathbf{D}_2$. 4

6. (a) State and explain Ampere's circuital law. 3

(b) A circular loop of wire of radius 'a' lying in xy plane with its centre at the origin carries a current **I** in the +Φ direction. Using Biot-Savart law find **H** (0, 0, z) and **H** (0, 0, 0). 5

(c) Define magnetic vector potential. 2

7. (a) State Faraday's law of electromagnetic induction. 2

(b) Prove that $\nabla \times \mathbf{H} = \mathbf{J} + \partial\mathbf{D}/\partial t$. The symbols have usual meaning. 4

(c) Write Maxwell's equations in differential and integral form and mention significance of each equation. 4

8. (a) What is meant by a uniform plane wave? 2

(b) Derive the wave equation from Maxwell's equation for conducting media and free space. 5

(c) State and explain Poynting Theorem.3

9. (a) Derive the expression for the attenuation and phase constants of uniform plane wave. 5

(b) Derive the expression for reflection and transmission coefficient when a uniform plane wave incidents normally on the surface of a perfect dielectric and find relation between them. 5

10. (a) Draw the equivalent circuit of two wire transmission line and explain it. 3

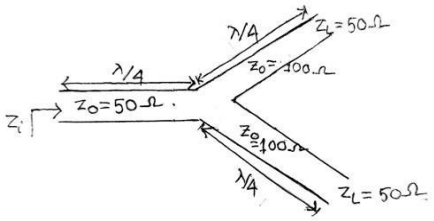
(b) What is characteristics impedance of a transmission line? Write the expression of characteristic impedance in terms of primary constant of transmission line. 2

(c) What is lossless transmission line? Show that phase velocity and characteristics impedance of lossless lines are independent of frequency. 5

11. (a) Define the term VSWR and reflection coefficient for transmission line and write the relation between them. 3

(b) Derive an expression for the input impedance Z_{in} of a lossless transmission line in terms of relevant parameters when the line is terminated in load impedance Z_L. 5

(c) A transmission line terminates in two branches, each of length λ/4 as shown in fig. below. The branches are terminated by 50 Ω loads. The lines are lossless and have characteristic impedances as shown. Determine the Z_i impedance as seen by the source.



2

-End-

B.Tech. Examination-2022
Electronics and Communication Engineering
(Even Semester Regular and Supplementary)
Electronic and Electrical Measurement (ECEUGPC07)

Full Marks: 80 Time: 3.00 Hrs

- *Answer all parts of a question in same place.*
- *Figures on the right hand side margin indicate full marks.*
- *Symbols have their usual meaning*

Group A
(Multiple choice questions)

*Answer any **Ten** from the following*

1. Write the correct answer out of the choices given [10X1=10]

(i) In measurement system, which of the following static characteristics are desirable?

(a) Accuracy (b) Precision
(c) Sensitivity (d) All of the above.

(ii) A null-type instrument as compared to a deflection-type instrument has

(a) A lower sensitivity (b) a faster response
(c) a higher accuracy (d) All of the above

(iii) The errors mainly caused by human mistakes are

(a) Systematic error (b) Instrumental error
(c) Observational error (d) Gross error

(iv) The shunt resistance in an ammeter is usually

(a) Equal to meter resistance (b) Less than meter resistance
(c) Of any value (d) More than meter resistance

(v) A Wheatstone bridge is balanced with all the four resistances equal to 1kΩ each. The bridge supply voltage is 100V. The value of one of the resistance is changed to 1010Ω. The output voltage is measured with a voltage measuring instrument of infinite resistance. The bridge sensitivity is

(a) 2.5mV/Ω (b) 10 V/Ω
(c) 25mV/Ω (d) none of the above

(vi) A 1 mA ammeter has a resistance of 100 ohm. it is to be converted to 1A ammeter. The value of shunt resistance is

(a) 100kohm (b) 0.1001ohm
(c) 1Kohm (d) 10kohm

(vii) Fluid friction damping can be used in

(a) Horizontally mounted instrument. (b) Vertically mounted instrument.
(c) Both (a) and (b). (d) None of the above

(viii) Frequency can be measured by using

(a) Maxwell's bridge (b) Schering bridge
(c) Wien's bridge (d) All of the above

(ix) An ammeter is an

(a) Indicating instrument (b) Integrating instrument
(c) Recording instrument (d) None of the above

(x) The lower end of scale of an M.I. instrument is

(a) Congested (b) Equidistant
(c) Both (a) and (b) (d) None of the above.

(xi) At very low frequencies in AC bridge, the source is _____

(a) Tuned circuit (b) Galvanometer
(c) e.m.f (d) Power line

(xii) Medium resistance is measured by _____

(a) De-Sauty's bridge (b) Maxwell's bridge
(c) Kelvin double bridge (d) Wheatstone bridge

Group B

(Short type questions)

*Answer any **five** from the following*

2. Draw the block diagram of the generalized measurement system and explain each block with a suitable example. [5]

3. Define random errors and explain how they are analysed statistically. [5]

4. Define the terms Accuracy, Precision, Reproducibility, Hysteresis and Fidelity as used for indicating instruments. [5]

5. What is resistance and how you can classify it? State the limitations of low resistance measurement using Wheatstone bridge. [5]

6. Define sensor and transducer and explain different types of the transducer with a suitable example. [5]

7. Draw and explain the block diagram of Dual – Slope Integrating type DVM. [5]

8. Sketch the curves showing deflection versus time for analog indicating instrument for under damping, critical damping and over damping. [5]

9. Explain how Wien's bridge can be used for measurement of unknown frequency. Derive the expression for frequency in terms of bridge parameters. [5]

Group C
(Long type questions)
*Answer any **three** from the following*

10.
(a) Explain with the help of phasor diagram, how unknown inductance can be measured using Maxwell's inductance –capacitance bridge. [9]

(b) The four arms of a bridge supplied from a sinusoidal source are configured as follows: [6]
Arm AB: A resistance of 100Ω in parallel with a capacitance of 0.5μF
Arm BC: A 200Ω noninductive resistance
Arm CD: A 800Ω noninductive resistance
Arm DA: A resistance R_x in series with a 1μF capacitance
Determine the value of R_x and the frequency at which the bridge will balance. Supply is given between terminals A and C and the detector is connected between nodes B and D.

11. **(a)** Explain the principle of working of a Kelvin's double bridge for measurement of unknown low resistance. Explain how the effects of contact resistance and resistance of leads are eliminated. [10]

(b) Describe the constructional details and derive a general equation for deflection for a spring-controlled repulsion-type moving iron instrument. [5]

12. **(a)** Drive the equation for deflection of a PMMC instrument if the instrument is spring controlled. Why not this instrument able to measure the ac quantity? [7]

(b) The coil of a PMMC instrument has 60 turns, on a former that is 18mm wide, the effective length of the conductor being 25mm. It moves in a uniform field of flux density 0.5 Tesla. The control spring constant is 1.5×10^{-6} Nm/°. Calculate the current required to produce a deflection of 100°. [5]

(c) What are shunts and multipliers? What are advantages of a shunt? [3]

13. **(a)** Explain the different components of cathode ray oscilloscope (CRO) and draw the block diagram of a digital storage oscilloscope (DSO). [8]

(b) Drive the gauge factor of a resistance strain gauge and obtain the expression for the same. [3]

(c) What is capacitive transducer? Draw and explain the differential arrangement of a capacitive transducer for measurement of linear displacement. [4]

14. Write short notes on any *three* of the following: [3x5=15]
(a) Anderson's bridge
(b) Meggar
(c) Digital frequency meter
(d) Electrodynamic Wattmeter
(e) Capacitive type microphone
(f) Eddy-Current Damping

-End-

Subject-Environmental Science
Course Code- UCCUGMC02
4th Sem

Full marks-80 **Time-3 Hours**

Group – A

Give tick (√) any 20 questions from the following. 20 x 1 = 20

1. What was the name of the primitive super continent of the earth?
a. Asia b. Gondwanaland c. Pangea d. Panthalassa

2. The nearest star of the Earth is
a. Proxima centauri b. Sun c. Jupiter d. none of these

3. The word Ecology is used first time by
a. AG Tansley b. Ernst Haeckel c. Einstein d. Robert Hooke

4. .....% of the sun radiation reflected back to space. It is called albedo.
a. 50% b. 64% c. 82% d. 34%

5. From which Nebula our solar system was originated?
a. Solar Nebula b. Solar gas c. Orion Nebula d. Rosette Nebula

6. What is the age of our Universe?
a. 15.5 billion years b.13.8 billion years c. 13.6 billion years d. 4.5 billion years

7. Which pyramid is always upright ?
a. Number pyramid b. Biomass pyramid c. Energy pyramid d. none of these

8. One non conventional sources of energy is
a. Coal b. Nuclear energy c. Solar energy d. Fossil fuel

9. In troposphere temperature always..... with increasing height.
a. Increases b. Decreases c. stable d. none of these.

10. One example of primary consumer is
a. Lion b. Rabbit c. Green plant d. Fox

11. The full form of DDT is
a. Di nitro di chloro toluene
b. diphenyl Dichloro toluene
c. dichloro diphenyl tri chloro ethane
d. none of these

12. How many species are present in the world, according to Camilo Mora (2011)?
a. 8.7 million b.50 million c. 8.4 million d. 15.5 million

13. One of the main groundwater pollutant is
a. carbon dioxide b. Arsenic c. CFC d. none of these.

14. The full form of the UNDP is
a. United Nations Development Programme
b. United Nations Departmental Programme
c. United Nations Disaster Programme

d. United Nations Cultural Programme

15. The main culprit gas of Ozone layer depletion is-
a . PFC b. CFC c. carbon dioxide d. water vapour

16. One example of water borne disease is-
a. Pneumonia b. Cholera c. AIDS d. common cold

17. The Chipko movement started in
a. Kerala b. West Bengal c. Western Ghat d. Garhwal Himalayan region

18.One of the biggest sources of SO2 in the atmosphere is
a. thermal power plants b. moving vehicles c. ocean d. green plants.

19. Ozone Layer protect us from harmful
a. ultraviolet rays b. infrared rays c. visible rays d. none of these

20. In an ecosystem autotrophs are
a. Animal b. Green plants c. Microbes d. Mammals.

21. The World Environment Day is celebrated on
a. 5th June b. 22 April c. 5th September d. 25th December

22. Electrostatic Precipitator is used to control over
a. Air Pollution b. Noise pollution c. Water pollution d. Soil pollution

23. Oxygen present in the atmosphere is
a. 11% b. 21% c. 31% d. 41%

Group- B

Answer any 6 questions from the following.

1.What is the Environment ? Describe briefly about the atmospheric layers. 2+8

2. What is Ecosystem ? Discuss briefly about the food pyramid and different types of food pyramids in an ecosystem. 2+8

3. What is a biogeochemical cycle ? Describe the Hydrological cycle. 3+7

4. Define water scarcity. Mention the reasons of water scarcity in the world. What is eutrophication ? 2+5+3

5. What is an air pollutant ? Classify the air pollutants with proper examples. What is acid rain ? 2+7+3

6. What do you mean by Greenhouse effect ? What are the main Greenhouse gases in the atmosphere ? Write the impacts of global warming. 3+2+5

7. Write a notes on Silent Valley movement. 10

8. Write any two short notes from the following- 5X2=10
A) Bhopal gas disaster
B) Minamata disease
C) Grassland ecosystem
D) Biopiracy

ALIAH UNIVERSITY
DEPARTMENT OF MATHEMATICS AND STATISTICS
COURSE CODE: MA234
Supplementary Exam

Total marks : 8X10=80 **Time allowed : 3 hours**

Candidates should read the following instructions carefully before answering the questions:

Instructions: Answer any **8** questions out of **11**. More than **8** questions attaining will cause evaluation of only the first **8**. The marks in each question are equally distributed. Symbols have their usual meanings.

1. (a) Find the differential equation of all circles which pass through the origin and whose centers are on the y-axis.
   (b) Solve the differential equation $\frac{dy}{dx} = \sin(x+y) + \cos(x+y)$.
2. (a) Solve the differential equation $(x^3 + 3xy^2)dx + (y^3 + 3x^2y)dy = 0$.
   (b) Solve the differential equation $(y + \frac{y^3}{3} + \frac{x^2}{2})dx + \frac{(x+xy^2)}{4}dy = 0$.
3. (a) Solve the differential equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = e^x \tan x$ by the method of variation of parameters.
   (b) Solve the differential equation $(x^2D^2 - xD + 2)y = x\log x$, where $D \equiv \frac{d}{dx}$.
4. (a) Find the eigenvalues and eigenfunctions of the eigenvalue problem $\frac{d^2y}{dx^2} + \lambda y = 0$ satisfying the homogeneous conditions $y(0) + y'(0) = 0$ and $y(1) + y'(1) = 0$.
   (b) Transform the differential equation $yp^2 + x^3p = x^2y$ $(p = \frac{dy}{dx})$ to Clairaut's form by using the transformation $x^2 = u$ and $y^2 = v$ and hence solve it.
5. (a) Solve the differential equation $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 8y = x^3 - x + e^{-2x}$ by the method of undetermined coefficients.
   (b) Solve by reducing to normal form $\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + (4x^2 - 3)y = e^{x^2}$.
6. (a) Determine the general solution of the system of differential equations: $\frac{dx}{dt} + 5x + y = e^t$, and $\frac{dy}{dt} + 3y - x = e^{-2t}$.
   (b) Solve by changing the independent variable $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 4\cos(\log(1+x))$.
7. (a) Solve the following one-dimensional homogeneous wave equation:

$$\frac{\partial^2 u}{\partial t^2} - 4\frac{\partial^2 u}{\partial x^2} = 0, \quad -\infty < x < \infty, t > 0$$

subject to the initial condition $u(x,0) = x,\ u_t(x,0) = \cos x$.

(b) Characterise the nature of the partial differential equation with proper justification

$$(a\frac{\partial}{\partial x} + b\frac{\partial}{\partial y})(c\frac{\partial}{\partial x} + d\frac{\partial}{\partial y})u = 0,$$

where a, b, c and d are differentiable functions on $\mathbb{R}^2$, whether the above equation is always hyperbolic, never hyperbolic, always parabolic, or never parabolic.

8. (a) What do you mean by an integrating factor? Explain with an example?

   (b) Solve the partial differential equation $y^2p - xyq = x(z - 2y)$ by Lagrange method.

9. (a) Show that events **A** and **B** are independent if and only if **A** and $\bar{\mathbf{B}}$ are independent.

   (b) Obtain the probability that a leap year contains 53 Mondays.

10. (a) If X is uniformly distributed in the interval $(-1, 1)$ then find the distribution of $|X|$.

    (b) Define probability mass and density function with examples.

11. (a) If X and Y are independent random variables, uniformly distributed over $(0, 1)$, then find the distribution of $X + Y$ and $X - Y$.

    (b) For two events A and B with $P(B) > 0$, show that $P(A/B) \geq \frac{P(A)+P(B)-1}{P(B)}$.