22162

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY UNA [HP]

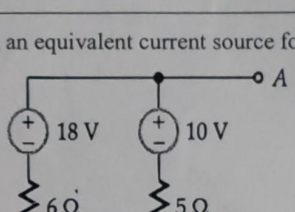
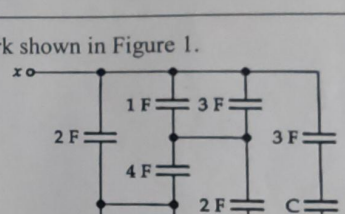
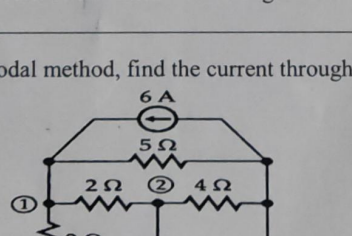
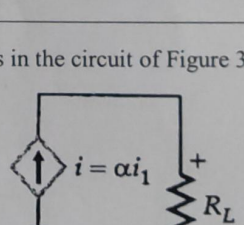
An Institute of National Importance under MoE

Saloh, Una (HP) – 177 209

Website: www.iiitu.ac.in

AY 2022-23
School of Computing
CURRICULUM: IIITUCSE22
Cycle Test – I
03, January'22

Degree	B. Tech.	**Branch**	CSE
Semester	I		
Subject Code & Name	EEC103: Basic Electrical and Electronics Engineering		
Time: 60 Minutes	**Answer All Questions**		**Maximum: 20 Marks**

Sl. No.	Question	Marks
1.a	Obtain an equivalent current source for the network shown in Figure 1.  Figure 1: Circuit Diagram for Problem 1.a  Figure 2: Circuit Diagram for Problem 1.b	(1)
1.b	What should be the value of C in Figure 2 such that the equivalent capacitance across x-y is 5 F?	(2)
1.c	Using nodal method, find the current through the resistors in the circuit of Figure 3.  Figure 3: Circuit Diagram for Problem 1.c  Figure 4: Circuit Diagram for Problem 2.a	(2)
2.a	With reference to Figure 4, determine the voltage drop across the pure resistance R_L if the control current in the dependent current source is 1 Amp. Assume $R_L = 2\Omega$.	(1)
2.b	What is the value of R in Figure 5 such that the power supplied by both the sources are equal to each other?	(2)

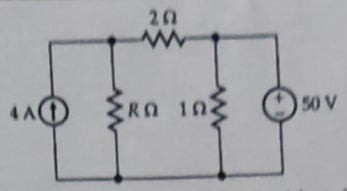
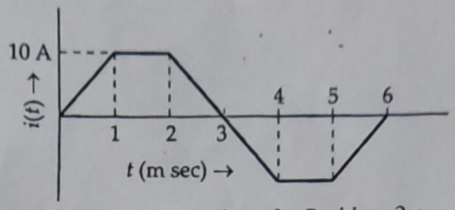
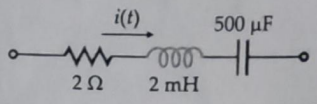
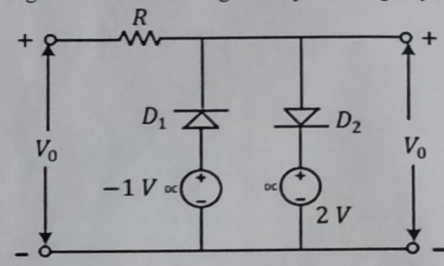
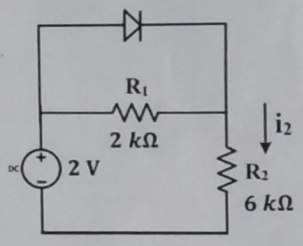
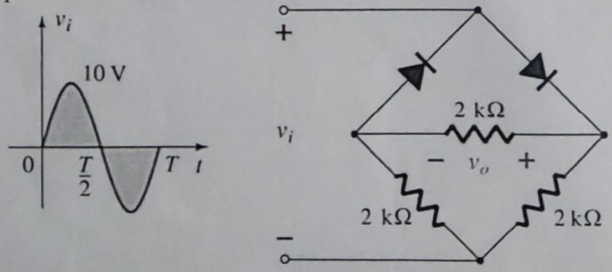


Figure 5: Circuit Diagram for Problem 2.b

2.c	A current source $i(t)$ shown in Figure 6 (a) is applied to a series LCR circuit of Figure 6 (b). Find voltage across each element.  Figure 6 (a) Waveform for Problem 2.c  Figure 6 (b) Circuit for Problem 2.c	(2)
3.a	Discuss the Load line analysis of diode with one simple example.	(1)
3.b	Two silicon diodes, with a forward voltage drop of $0.7V$, are used in the circuit shown in the Figure 7. Find the range of input voltage V_i for which the output voltage $V_o = V_i$.  Figure 7: Circuit Diagram for Problem 3.b  Figure 8: Circuit Diagram for Problem 3.c	(2)
3.c	Assume that the diode in the Figure 8 has $V_{on} = 0.7\ V$. Find the magnitude of the current i_2 (in mA).	(2)
4.a	Why are bridge rectifiers preferred over other rectifiers? Justify your answer.	(1)
4.b	Derive the formula to calculate the ripple factor for center tapped rectifier.	(2)
4.c	Draw the output waveform for the network of Figure 9. Calculate the output dc level and the required PIV of each diode.  Figure 9: Circuit Diagram for Problem 4.c	(2)

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AY 2022-23
SCHOOL OF COMPUTING
CURRICULUM: IIITUGCSE22
Cycle Test – I
02, Jan.'23

Degree	B. Tech.	**Branch**	CSE
Semester	First		
Subject Code & Name	CYC102: Engineering Chemistry		
Time: 60 Minutes	**Answer All Questions**		**Maximum: 20 Marks**

Sl. No.	Question	Marks
1.a	Illustrate the negative impact of caustic embrittlement in boilers?	(1)
1.b	A protein sample consists of an equimolar mixture of hemoglobin (M = 15 Kg mol^{-1}), ribonuclease (M = 10 Kg mol^{-1}) and myoglobin (M = 20 Kg mol^{-1}). Calculate the number-average ($\overline{M_n}$) and weight-average ($\overline{M_w}$) molecular masses. Which is greater?	(2)
1.c	Two litres of water obtained from a bore well in Kondapur near Hyderabad gave the following analysis for salts: $FeSO_4$ = 30.4 mg; $CaSO_4$ = 13.6 mg; $MgCl_2$ = 38 mg; $Ca(HCO_3)_2$ = 32.4 mg, $Mg(HCO_3)_2$ = 14.6 mg; NaCl = 11.7 mg. Find out the temporary hardness, permanent hardness and total hardness of water in ppm units assuming the atomic masses of Fe = 56, Ca =40, Mg = 24 and Na =23.	(2)
2.a	List the monomers used in the fabrication of the following polymers: (i) Nylon 6,6 (ii) Neoprene	(1)
2.b	Explain the mechanism of demineralization of water by Ion Exchange Process along with the concept of regeneration of exhausted exchange resins.	(2)
2.c	What type of hardness is associated with the dissolution of $MgSO_4$ salts in water? Determine the amount of $MgSO_4$ (in grams) dissolved per litre of solution which gives 200 ppm of water hardness? (Atomic masses of Mg = 24, S = 32 and O = 16)	(2)

3.a Differentiate between Addition and Condensation polymer with suitable examples. (1)

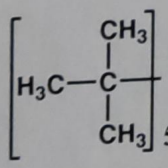
3.b A 50 mL of hard water containing 1.2 g of $CaCO_3$ per litre required 15 mL of EDTA solution for the end-point, whereas 50 mL of water sample required 19 mL of EDTA solution and 50 mL of boiled sample of water required 11 mL of EDTA solution for the end-point. Calculate the total hardness, permanent hardness and carbonate hardness of the water sample. (2)

3.c Identify the external and internal conditioning methods of water softening for subsequent use in domestic and industrial applications. (2)

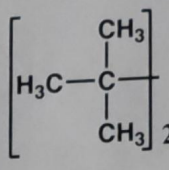
4.a Outline the differences between Biochemical oxygen demand and Chemical oxygen demand. (1)

4.b Define the term Desalination. With a well-illustrated diagram explain the process of Reverse Osmosis. (2)

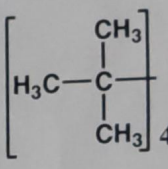
4.c Apply the concept of number average ($\overline{M_n}$) and weight average ($\overline{M_w}$) molecular masses to determine the Polydispersity Index (PDI) of the polymer with the following composition: (2)



is 25% ;



is 35% ;



is 40%.

Given that atomic mass of C = 12 and H = 1.

Good Luck

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AY 2022-23

School of Basic Sciences

CURRICULUM: IIITUGCSE22

Cycle Test – I

03, Jan.'23

Degree	B. Tech.	**Branch**	CSE
Semester	I		
Subject Code & Name	BIC104: Introduction to Biotechnology		
Time: 60 Minutes	**Answer All Questions**		**Maximum: 20 Marks**

Sl. No.	Question	Marks
1.a	List the cell organelles that are responsible for drug metabolism and detoxification of waste materials.	(1)
1.b	Explain how the DNA was proved to be the genetic material experimentally?	(2)
1.c	Model the block diagram of DNA transcription process.	(2)
2.a	Calculate the percentage of thymine in a DNA sample containing 42% guanine.	(1)
2.b	Demonstrate a process of semi-conservative DNA replication including enzymes, proteins, and other components involved in this vital process.	(2)
2.c	The template strand of a segment of double-helical DNA contains the sequence as follows: 5'-CTTAACACCCCTGACTTCGCGCCGTCG-3'. i. What is the base sequence of the mRNA that can be transcribed from this strand? ii. Calculate the number of codons present in mRNA sequence starting from the 5' end.	(2)
3.a	Interpret the following two sequences retrieved from the DNA sequencing technique: A T C C G A A T G - - - C G C Human gene | | | | | | | | | A T C A T A T G C C A G C G C Mouse gene	(1)
3.b	Examine the working mechanism of the PCR technique for DNA amplification? How is the advancement introduced in real-time or quantitative PCR (qPCR)?	(2)
3.c	Model the block diagram for cDNA library with a suitable real-life example employed in the biotechnology industry.	(2)
4.a	List the biotechnological products that are employed to treat the acid attack and heart attack.	(1)
4.b	Design a process for the separation of a specific therapeutic protein, 25 kDa, from a mixture of three proteins of sizes 25 kDa, 50 kDa, and 100 kDa using a suitable chromatography technique. How is the isolated protein verified using a spectroscopy technique?	(2)
4.c	Construct the process of cheese making using genetically modified cells in the biotechnology industry.	(2)

******GOOD LUCK*******

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AY 2022-23
School of Computing
Curriculum: IIITUGCSE22
Cycle Test - I
January 2, 2023

Degree	B.Tech
Branch	CSE
Semester	I
Subject code/name	MAC111/ Engineering Mathematics
Time	60 minutes
Maximum Marks	20

Answer all the questions.

Q.No.	Questions	Marks
1(a)	Find the eigen values of the matrix given below: $$A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ 0 & 2 & 3 \end{bmatrix}$$	1
1(b)	What are the eigen vectors of the matrix A mentioned in 1(a)?	2
1(c)	If possible, diagonalize the matrix A mentioned in 1(a).	2
2(a)	State if the following statement is true or false. Give reason for the answer. A $n \times n$ singular matrix has rank n.	1
2(b)	Outline the steps to find a row echelon matrix which is row-equivalent to $A = \begin{bmatrix} 1 & -i \\ 2 & 2 \\ i & 1+i \end{bmatrix}$. Is the system $AX = 0$ consistent? Give reasons for the answer.	2
2(c)	Investigate the convergence of the series given below: $$\sum_{n=1}^{\infty} a_n = \sum_{n=1}^{\infty} \frac{1}{1+2+3+4+...+n}.$$	2
3(a)	For what values of k does the quadratic form $Q = k(x_1^2 + x_2^2 + x_3^2)$ becomes positive definite?	1

3(b)	Obtain the normal form of the matrix given below: $$A = \begin{bmatrix} 5 & 9 & 6 \\ 0 & 2 & 3 \\ 0 & 0 & 7 \end{bmatrix}$$	2
3(c)	Transform the quadratic form $Q = 3x^2 + 8xy - 3y^2$ into Canonical form. Write its index and signature.	2
4(a)	Let $a_n = \frac{1}{n^{0.75}}$. Does the series $\sum_{n=1}^{\infty} a_n$ converge? Explain giving reasons.	1
4(b)	Examine the series $\sum_{n=1}^{\infty} \frac{1}{n3^n}$ for its convergence.	2
4(c)	Examine whether the series $\sum_{n=1}^{\infty} n!e^{-n}$ is convergent or divergent.	2

******* All the best*******