AY 2021-22
School of Electronics
Curriculum: IITUGECE20
Cycle Test - 1
27-06-2022

Degree	B.Tech.
Branch	ECE
Semester	II
Subject code/name	MAC221/ Mathematics-II
Time	60 minutes
Maximum Marks	20

Answer all the questions.

Q. No.	Questions	Marks
1(a)	What is the degree and order of the following differential equation? $$[1+(y')^2]^{\frac{1}{2}} = 5y.$$	(1)
1(b)	Outline the solution of the following differential equation: $$(3x^2y^3e^y + y^3 + y^2)dx + (x^3y^3e^y - xy)dy = 0$$	(2)
1(c)	Outline the general solution of the following differential equation: $$\frac{ds}{du} + s = ue^{-u} + 1$$	(2)
2(a)	Define orthogonal trajectories for a given family of curves.	(1)
2(b)	Show that the family of curves represented by the following equation $$\frac{x^2}{c} + \frac{y^2}{c+2} + 1 = 0,$$ is self-orthogonal.	(2)
2(c)	Outline the general solution of the following equation: $$y''' - y'' + 4y' - 4y = \sin 3x$$	(2

3(a)	What is the sufficient condition for a function $f(t)$ to have Laplace Transform?	(1)
3(b)	Examine the inverse Laplace Transform of the following function: $$F(s) = \frac{4e^{\frac{-s\pi}{2}}}{s^2 + 16}$$	(2)
(c)	Simplify using Laplace Transform, the following initial value problem: $$y' + y = (\cos t)u_{\frac{\pi}{2}}(t); \quad y(0) = 2$$	(2)
4(a)	Define Dirac-Delta function and write its Laplace Transform.	(1)
4(b)	Consider the following integral equation: $$f(t) = t + e^{-2t} + \int_0^t f(\tau)e^{2(t-\tau)} \, d\tau$$ Use Laplace Transform to find $f(t)$ as the solution of this integral equation.	(2)
(c)	Find the Laplace Transform of the following periodic function: $$f(t) = t, \ 0 \leq t \leq a, \ f(t+a) = f(t)$$	(2)

* * * All the best* * *

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AY 2021-22
SCHOOL OF ELECTRONICS
CURRICULUM: IIITUGECE20
Cycle Test – I
27-06-2022

Degree	B. Tech.	Branch	ECE
Semester	Second		
Subject Code & Name	CYC222: Engineering Chemistry		
Time: 60 Minutes	Answer All Questions		Maximum: 20 Marks

Sl.No.	Question	Marks
1.a	What is calgon? How does it function in water treatment process?	(1)
1.b	500 mL of water sample on titration with N/50 H_2SO_4 using phenolphthalein as indicator gave the end point when 10 mL of acid was used. Another lot of 500 mL of the sample also required 10 mL of the acid to obtain methyl-orange end point. What type of alkalinity is present in the sample and what is its magnitude?	(2)
1.c	Analysis of water sample gave the following results: H_2SO_4 = 196 mg/L, $MgSO_4$ = 24 mg/L, $CaSO_4$ = 272 mg/L and NaCl = 25 mg/L. Water is to be supplied to the town of population of one lakh only. The daily consumption of water is 50 litre per head. Calculate the cost of lime and soda required for the softening of hard water for town for the month June 2022, if the cost of lime is Rs.5.00 per kg and cost of soda is Rs. 10.00 per kg.	(2)
2.a	A zeolite softener was exhausted and regenerated by passing 100 L of NaCl solution of strength 585 g/L. Calculate the total hardness of the water sample in ppm, if the zeolite softener can soften 1000 L of water before regeneration.	(1)
2.b	Explain the role of chlorine in the tertiary treatment of water used for domestic purposes.	(2)
2.c	Explain the principle and working of Hot-Lime soda process with the help of well labelled diagram. ①	(2)
3.a	What is Bakelite? Outline the reactions of synthesis under basic conditions. 0·5	(1)
3.b	What is emulsion polymerization? How is it better than suspension polymerization? ①	(2)
3.c	Identify the monomeric units of the following polymers: a) Orlon — b) Plexiglass — c) Lexan — d) Kevlar	(2)
4.a	How does chemical resistivity affect the structure and properties of the polymers?	(1)
4.b	Explain the effect of n-doping on the conductivity of polyacetylene with the help of detailed mechanism.	(2)

3+1.5+1+0.5+1
+0.5+0.5

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	Consider an equal number of protein mixture containing the following: Hemoglobin 20 Kg/mol, Ribonuclease 10 Kg/mol, and Myoglobin 15 Kg/mol. Calculate number average molecular weight, weight average molecular weight, and polydispersity index of the protein solution.	(2)
	****Good Luck****	

2/205

AY 2021-22

School of Basic Sciences

CURRICULUM: IIITUGECE20

Cycle Test – I

28, Jun.'22

Degree	B. Tech.	Branch	ECE
Semester	II		
Subject Code & Name	BIC203-Introduction to Biotechnology		
Time: 60 Minutes	Answer All Questions		Maximum: 20 Marks

Sl. No.	Question	Marks
1.a	Explain biotechnology tree and identify regulatory bodies that work for quality checks of biotechnological products.	(1)
1.b	Outline the bioengineered cell that can have higher production of energies, proteins, lipids, and detoxifications as compared to the normal cell.	(2)
1.c	Demonstrate the process of semi-conservative replication of DNA and provide the description of every component involved in a DNA replication fork.	(2)
2.a	What are the applications of recombinant proteins namely blood factor VIII and interferons, respectively?	(1)
2.b	Summarize the operon function to regulate gene expression with suitable example.	(2)
2.c	Explain why the quality control and quality assurance are important in biotechnology companies?	(2)
3.a	Solve the mRNA sequence after transcription from a segment of a sense strand of DNA is 5'-ATGGACCAGA-3'.	(1)
3.b	Model the block diagram of genomic and cDNA libraries.	(2)
3.c	Identify the codons number and decode the amino acid sequence derived from the given mRNA sequence as follows: 5'-AGCACCAUGCCCCGAACCUCAAAGUGAAACAAAAAA-3'.	(2)
4.a	How are mRNA molecules separated from a mixture of DNA, protein, lipids, and carbohydrates present in a bacterial cell?	(1)
4.b	Outline the working mechanism of Next Generation Sequencing technique with suitable examples.	(2
4.c	Choose the process of blue/white screening work for selecting recombinant clones containing an insert of interest.	(

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AY 2021-22
School of Electronics
CURRICULUM: IIITUGECE20
Cycle Test – I
29, June'22

Degree	B. Tech.	Branch	ECE
Semester	II		
Subject Code & Name	EEC205: Signals and Systems		
Time: 60 Minutes	Answer All Questions		Maximum: 20 Marks

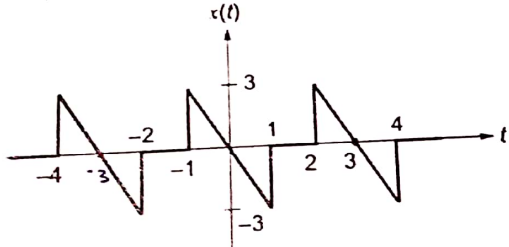| Sl. No.	Question	Marks
1.a	Find the value of the integral; $$\int_{-\infty}^{\infty} \delta(t) \cos \frac{3t}{2}\, dt$$	(1)
1.b	Check whether the signal $s(t) = 8\cos\left(20\pi t - \frac{\pi}{2}\right) + 4\sin(15\pi t)$ is energy or power signal. Justify your answer.	(2)
1.c	Two sequences $x_1[n]$ and $x_2[n]$ have the same energy. Suppose $x_1[n] = \alpha 0.5^n u[n]$, where α is a positive real number and $u[n]$ is the unit step sequence. Assume: $$x_2[n] = \begin{cases} \sqrt{1.5} & for\ n = 0,1 \\ 0 & otherwise \end{cases}$$ Find the value of α.	(2)
2.a	Consider the sequence; $$x[n] = \begin{bmatrix} -4 - j5, & 1 + j2, & 4 \\ & \uparrow & \end{bmatrix}$$ Show the conjugate antisymmetric part of the given sequence.	(1)
2.b	The waveform of a periodic signal $x(t)$ is shown in Figure 1. A signal $g(t)$ is defined by $g(t) = x\left(\frac{t-1}{2}\right)$. Calculate the average power of signal $g(t)$. Figure 1: Waveform for Problem 2.b	(2)

1

2.c	For a system the input – output relationship is given by the following expression: $$y[n] = \left(\sin \frac{5}{6}\pi n\right)x(n)$$ Check whether this system is (i) linear or non-linear (ii) Invertible or non-invertible.	(2)
3.a	The impulse response of a continuous time system is given by $h(t) = \delta(t-1) + \delta(t-3)$. Calculate the value of the step response at $t = 2$.	(1)
3.b	Calculate and sketch the convolution of $u(t) - u(t-1)$ and $u(t) - u(t-2)$.	(2)
3.c	Let $y[n]$ denote the convolution of $h[n]$ and $g[n]$, where $h[n] = (1/2)^n.u[n]$ and $g[n]$ is a causal sequence. If $y[0] = 1$ and $y[1] = 1/2$, then find the value of $g[1]$.	(2)
4.a	A half-wave rectified sinusoidal waveform has a peak voltage of 10V. Calculate the average value and the peak value of its fundamental component.	(1)
4.b	A periodic signal $x(t)$ of period T_0 is given by; $$x(t) = \begin{cases} 1, & |t| < T_1 \\ 0, & T_1 < |t| < \frac{T_0}{2} \end{cases}$$ Calculate the DC component of $x(t)$.	(2)
4.c	Consider an impulse train denoted by the following: $$s(t) = \sum_{n=-\alpha}^{\infty} \delta(t - nT_0)$$ Find the exponential Fourier series representation.	(2)

$$= \frac{V_0}{\sqrt{2}}$$

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Cycle Test - 1
June 28, 2022

Degree		B. Tech.	Branch	ECE
Semester		II		
Subject Code & Name		CSC204: Basics of Programming in C		
Time: 60 Minutes		Answer All Questions		Maximum: 20 Marks

Sl. No.	Question	Marks
1.a	What is the contribution of the compiler in facilitating the execution of a program?	1
1.b	Explain the preferred way of facilitating the following operation in computer systems: -8+5=? Also, determine the final result of this operation.	2 (1+1)

1.c	Apply the concept of reversing a number to fill the blanks in the following pseudo code: ! =
	
	 read n;
	 rev ← 0;
	 until (n__0) {
	     rev ← rev*__ + n % __;
	     n ← n/__;
	 }
	 write rev;
		2

		1
2.a	Enlist the general operations of a computer system.	1
2.b	Contrast between Constants, Variables, and Keywords using proper examples.	2
2.c	Summarize the activities required for the Program Development Cycle through a structured discussion.	2

3.a	Illustrate the formatted output of the following code:
	
	 ```#include <stdio.h>```
	 ```int main()```
	 ```{```
	 ```int m=2, n=3, o=7;```
	 ```if ((m>=n) && (m>=o));```
	 ``` printf ("\n The largest number is: %d", m);```
	 ```if ((n>=m) && (n>=o));```
	 ``` printf ("\n The largest number is: %d", n);```
	 ```if ((o>=m) && (o>=n));```
	 ``` printf ("\n The largest number is: %d", o);```
		1

23

		return 0; }	
		Discuss with a proper rationale.	
3.b		Develop an algorithm to read a character from standard input and write its ASCII value on standard output.	2
3.c		Develop an algorithm for Petrol Vending Machine to calculate the volume of Petrol that needs to be released based on given input of "amount for buying petrol".	2
4.a		What is the significance of preprocessor directives in a program? Give an example.	1

4.b		Identify the error (if any) in the following code:
		
		#include<stdio.h>
		int main(){
		int m=n=5; m, n = 5
		int sum=0;
		sum=m+n;
		printf("%d \t %d",sum,n);
		return 0;
		}
		
		Also, write the output of the execution of the above code.
			2

4.c		Explain the process of caching and how it affects the performance of the computer system.	2 (1+1)

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