INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
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Saloh, Una (HP) – 177 209
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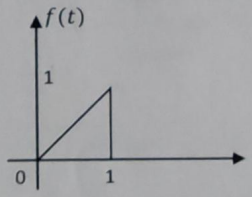
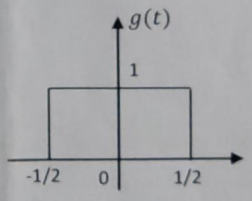
**AY 2021-22**
**School of Electronics**
**CURRICULUM: IIITUGECE20**
**Cycle Test – II**
**27, July'22**

| | | | |
|---|---|---|---|
| **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 | If the Fourier transform of $f(t)$ is $F(\omega)$, determine the inverse Fourier transform of $F(7\omega + 5)$. | (1) |
| 1.b | Derive the expression of Parsevals's theorem for Power signals. | (2) |
| 1.c | Evaluate the Fourier transform of signal $g(t) = e^{-10\|t\|} sin100t$. | (2) |
| 2.a | Evaluate the Fourier transform of signal $f(t) = 1/\pi t$. | (1) |
| 2.b | Calculate the Fourier transform of $g(t)$ shown in Figure 1(b) in terms of $F(\omega)$ to be computed from Figure 1(a).   Figure 1(a)   Figure 1 (b) | (2) |
| 2.c | Estimate the energy at response of ideal LPF having cut-off frequency 1rad/sec for input $x(t) = e^{-t}.u(t)$. | (2) |
| 3.a | Find the Auto-correlation of function $f(t) = e^{-at}.u(t)$. | (1) |
| 3.b | Determine the energy of signal $f(t) = t\left(\frac{\sin t}{\pi t}\right)^2$ using the Parseval's theorem for energy signals. | (2) |
| 3.c | Explain the properties of autocorrelation for power signals. | (2) |
| 4.a | Find Nyquist interval of $f(t) = sinc(700t)$. | (1) |
| 4.b | Two signals $f_1(t)$ and $f_2(t)$ are defined as below: $f_1(t) = Sa^5(150\pi t)$ $f_2(t) = Sa^7(90\pi t)$ Find the Nyquist frequency of $f_1(t) \otimes f_2(t)$. | (2) |
| 4.c | Discuss the condition of sampling for any signal with proper justification. | (2) |

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**Cycle Test - II**
**July 26, 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 does the following declaration mean?<br>char (*stPTR) [30]; | 1 |
| 1.b | Develop a recursive function to find maximum valued element in a set. | 2 |
| 1.c | Apply the concept of iterative structures and increment operator to determine the correctness of the following code:<br>`#include<stdio.h>`<br>`int main()`<br>`{`<br>`int x=5, y=10;`<br>`for(int i=0;i<x;i++)`<br>`printf("%d ", ++(x+y/y));`<br>`return 0;`<br>`}` | 2 |
| 2.a | Define the concept of Divide and Conquer in Programming with the help of an example. | 1 |
| 2.b | Explain the error persisting in the following code:<br>m[x][y][z][a] == (*(*(*(m+x)+y)+z)+a); | 2 |
| 2.c | Identify the factors and demonstrate with an example a scenario that returns more than one value back from called function to caller function. | 2 |
| 3.a | Illustrate with an example the similarity between *break* and *goto* statements. | 1 |
| 3.b | Develop an algorithm to extract the username of a given email id. | 2 |
| 3.c | Develop an algorithm to eliminate duplicate values from a set of elements. | 2 |
| 4.a | What will be the output for the following code:<br>`#include<stdio.h>`<br>`int main()`<br>`{`<br>`int data;` | 1 |

```
    int* pointR = &data;
    printf("%zu", sizeof( *(long*)pointR ));
}
```

Brief explanation is required.

4.b

Examine the following code:

```
#include <stdio.h>

int m, n, o = 0;
void prin(void);
void main( )
{
    int m = 1; /* Line 1 */
    prin();
    m = m + 1;
    prin();
    printf("\n %d %d", m, n);
}
void prin(void)
{
    static int m=2;   /* Line 2 */
    int n=1;
    m = m + ++n;
    printf("\n %d %d", m, n);
}
```

i) What is the output of this code?

ii) What are the outputs if the variable declared in Line 2 is of *register* and *auto* storage classes?

2

4.c

Construct a function to compare two strings for equality without using strcmp() library function.

2

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

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**AY 2021-22**
**SCHOOL OF ELECTRONICS**
**CURRICULUM: IIITUGECE20**
**Cycle Test – II**
**25-07-2022**

| | | | |
|---|---|---|---|
| **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 | Derive the equation for Net calorific value (NCV) based on bomb calorimeter. | (1) |
| 1.b | Explain the principle and working of bomb calorimeter with well labelled diagram. | (2) |
| 1.c | What is proximate analysis of coal? Explain its significance. | (2) |
| 2.a | 0.5 g of sample of coal was used in bomb calorimeter for the determination of calorific value. The calorific value of coal was found to be 8600 cal/g. The ash formed in the bomb calorimeter was extracted with acid and the acid extract was heated with barium nitrate solution to obtain the precipitate of barium sulphate. The precipitate obtained was filtered, dried and weighed. The weight of precipitate was found to be 0.05g. Calculate the percentage of Sulphur in the coal sample. | (1) |
| 2.b | A sample of coal contains: C = 93%; H = 6% and ash = 1%. The following data were obtained when the above coal was tested in bomb calorimeter: (i) weight of coal burnt = 0.92g; (ii) weight of water taken = 550g; (iii) water equivalent of bomb calorimeter = 2200g; (iv) rise in temperature = 2.42°C; (v) fuse wire correction = 10.0 cal; (vi) acid correction = 50.0 cal. Calculate gross and net calorific value of the coal, assuming the latent heat of condensation of steam as 580 cal/g. | (2) |
| 2.c | Explain the process of Otto-Hoffmann by-product oven for the manufacture of metallurgical coke. How does it follow the regenerative principle of heat economy? | (2) |
| 3.a | Why is coke preferred to coal in metallurgical processes? | (1) |
| 3.b | A gaseous fuel has the following composition by volume: $H_2$ = 30%; $CH_4$ = 5%; CO = 20 %; $CO_2$ = 6%; $O_2$ = 5 % and $N_2$ = 34 %. If 50% excess air is used find the weight of air actually supplied per $m^3$ of this gas. Molecular weight of air = 28.97 g/mol. | (2) |

| | | |
|---|---|---|
| 3.c | The percentage composition of sample of bituminous coal was found to be as following:<br>C = 75.4%, H = 4.5%, O = 12.5%, N = 3.1%, S = 1.4%. and rest is ash. Calculate the minimum weight of air necessary for the complete combustion of 1 kg of coal and percentage composition of dry products of combustion by weight. | (2) |
| 4.a | The percentage composition of coal sample is: C =85%, H = 5%, O = 6%, N = 4%, S = 2%, ash = 5% and moisture = 3%. Calculate the minimum amount of air needed in combustion of 1 kg of coal. | (1) |
| 4.b | A gaseous fuel has the following composition by volume:<br>Methane = 5%; hydrogen = 20 %, carbon monoxide = 25 %, carbon dioxide = 6%, and rest nitrogen. If 20 % excess air is used for combustion, then calculate volume of air supplied per $m^3$ of fuel and composition of dry flue gases. | (2) |
| 4.c | What is flue gas analysis? How is it carried out by Orsat's apparatus? | (2) |
| | ****Good Luck**** | |

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AY 2021-22
School of Electronics
Curriculum: IIITUGECE20
Cycle Test - II
25-07-2022

| | |
|---|---|
| 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) | State Parseval's identity for Fourier series. | 1 |
| 1(b) | Determine the Fourier series representation of the $2\pi-$periodic function: $$f(x) = \frac{1}{2}(\pi - x),\ 0 < x < 2\pi.$$ | 2 |
| 1(c) | Using the result of 1(b), evaluate the series: $$1 + \frac{1}{2^2} + \frac{1}{3^2} + \cdots\cdots$$ | 2 |
| 2(a) | Find the first harmonic using the table given below: <table><tr><td>x</td><td>0</td><td>1</td><td>2</td></tr><tr><td>y</td><td>1</td><td>2</td><td>0</td></tr></table> | 1 |
| 2(b) | Calculate the half range sine expansion of the function given below: $$f(x) = x,\ 0 \leq x \leq 1.$$ | 2 |
| 2(c) | Determine the Fourier sine series representation of the following $2\pi-$periodic function: $$f(x) = 1,\ 0 < x < \pi.$$ | 2 |

| | | |
|---|---|---|
| 3(a) | State the Convolution theorem for Fourier transform. | 1 |
| 3(b) | Apply Convolution theorem, to find the inverse Fourier transform of the following function:<br>$$\frac{1}{(1+\omega^2)^2}$$<br>Given that $\mathcal{F}(e^{-\lvert x\rvert}) = \frac{2}{1+\omega^2}$. | 2 |
| 3(c) | Evaluate the Fourier cosine transform of $f(x) = x$. | 2 |
| 4(a) | If $\mathcal{F}(f(x)) = F(\omega)$, then what is $\mathcal{F}(f(x)\cos(ax))$? | 1 |
| 4(b) | Determine the Fourier cosine and Fourier sine transform of the following function:<br>$$f(x) = \begin{cases} k, & 0 < x < a, \\ 0, & x > a. \end{cases}$$ | 2 |
| 4(c) | Apply Fourier transform to solve the following ordinary differential equation:<br>$$\frac{d^2u}{dx^2} - xu = 0$$<br>associated with the far field boundary condition $\lim_{\lvert x\rvert\to\infty} u(x) = 0$. | 2 |

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**AY 2021-22**
**School of Basic Sciences**
**CURRICULUM: IIITUGECE20**
**Cycle Test – II**
**26, Jul.'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 | Define Bioweapon pathogens and list the biotechnological techniques employed for the detection of Bioweapon pathogens. | (1) |
| 1.b | Compare the lactic acid fermentation and alcohol fermentation processes pertaining to the production of specific ATP energies. | (2) |
| 1.c | Make use of the fusion tag protein that facilitates the ease of downstream processing for the purification of recombinant protein. | (2) |
| 2.a | Calculate the yield percentage of the purified protein from the purification data as follows: | (1) |

| S. No. | Purification Steps | Total protein (mg) | Total Enzyme Activity (units) | Specific activity | Yield % |
|---|---|---|---|---|---|
| 1. | Crude sample/Homogenate | 10,000 | 20,00,000 | 200 | 5000 |
| 2. | Purified protein | 5,000 | 25,00,000 | 500 | 1000 |

| | | |
|---|---|---|
| 2.b | Summarize the working mechanisms of antibody towards the destruction of the harmful microbial infection. | (2) |
| 2.c | Model the process of monoclonal antibody production, and explain the strategy adopted to minimize the HAMA response. | (2) |
| 3.a | Calculate the number of peptide bonds present in the hexapeptide structure. | (1) |
| 3.b | Model the block diagram of protoplast fusion technique for developing the hybrid plant. | (2) |
| 3.c | Identify the engineering strategies with suitable examples for the production of herbicide resistant and insecticide resistant plants. | (2) |
| 4.a | List the role of following therapeutic proteins, superoxide dismutase and erythropoietin. | (1) |
| 4.b | The amino sequence of peptide is as follows: Cys-Ser-Cys-Ser-Ser-Leu-Met-Asp-Lys-Glu-Cys-Val-Tyr-Phe-Cys-His-Leu-Asp-Ile-Ile-Trp. Find out the pattern of peptide fragments obtained after the trypsin and cyanogen bromide treatments, respectively. | (2) |
| 4.c | Utilize the unique characteristics of bioluminescent marine bacteria for the development of biotechnological applications. Explain with suitable example. | (2) |

****GOOD LUCK*****