Name: Shashank Agrawal

Enrolment No: 145

UPES

END SEMESTER EXAMINATION, DECEMBER 2017

Course: MATH 1002 Mathematics-I

Programme: B. Tech. (All SCE Branches)

Semester: I (ODD-2017-18)

Time: 03 hrs.

Max. Marks:100

Instructions:

Attempt all questions from **Section A** (each carrying 4 marks); attempt all questions from **Section B** (each carrying 8 marks); attempt all questions from **Section C** (each carrying 20 marks).

Section A

(Attempt all questions)

1.	Show that the system of equations $x + y + z = -3, 3x + y - 2z = -2, 2x + 4y - 7z = 7$ is not consistent.	[4]	CO 3
2.	Show that the set of vectors $[1, 1, 0], [1, 0, 1], [0, 1, 1]$ are linearly independent.	[4]	CO 3
3.	Construct a truth table for the proposition $\sim(p \vee q) \vee (\sim p \wedge \sim q)$.	[4]	CO 2
4.	Find n^{th} derivative of $sin^2 x\, cos^3 x$.	[4]	CO 1
5	Evaluate $\int_0^4 \int_0^{2\sqrt{z}} \int_0^{\sqrt{4z-x^2}} dy\, dx\, dz$.	[4]	CO 1

SECTION B

(Q6-Q9 are compulsory and Q10 has internal choice)

6.	Using Cayley Hamilton theorem find the inverse of the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$.	[8]	CO 3
7.	Show that t is a valid conclusion from the premises $p \to q$, $q \to r$, $r \to s$, $\sim s$ and $p \vee t$.	[8]	CO 2
8.	Divide 120 into three parts so that the sum of their products taken two at a time shall be maximum.	[8]	CO 1
9.	Show that the set $G = \{1, -1, i, -i\}$, where i is a fourth root of unity is a group with respect to multiplication.	[8]	CO 4

10.	If x is an element of a cyclic group of order 15 and two of x^3, x^5 and x^9 are equal, determine $o(x^{13})$ where o denotes the order. **OR** Let $U(n)$ be a group defined as $U(n) = \{m \in N: 1 \leq m \leq n \text{ and } gcd\ (m,n) = 1\}$. Is $U(8)$ isomorphic to $U(12)$? Justify your answer.	[8]	CO 4
	SECTION C **(Q11 is compulsory and Q12A, Q12B have internal choice)**		
11.A	Evaluate $\iint \frac{x^2y^2}{x^2+y^2} dxdy$ by changing it to polar co-ordinates over the annular region between circles $x^2 + y^2 = a^2$ and $x^2 + y^2 = b^2$; $a > b > 0$.	[10]	CO 1
11.B	Let G be the group of integers under addition and let N be the set of all integral multiples of 3. Prove that N is a subgroup of G and determine all the cosets of N in G.	[10]	CO 4
12.A	Is the matrix $\begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$ diagonalizable? Justify your answer. **OR** Given that $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$ where a, b, c are roots of $x^3 + x^2 - k = 0$ (k is a constant). Prove that A is orthogonal.	[10]	CO 3
12.B	Find the order of each element in the cyclic group $G = \{a, a^2, a^3, a^4, a^5, a^6 = e\}$ where e being the identity element. **OR** Show that the set R of real numbers is a commutative ring with unity with respect to addition and multiplication of real numbers.	[10]	CO 4

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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech (CSE+ All IBM Branches)
Subject (Course): Open Source & Open Standards)
Course Code : CSOS1001
No. of page/s:2

Semester – 1st
Max. Marks : 100
Duration : 3 Hrs

SECTION-A
(Attempt all questions)
(4*5=20 marks)

1. Write full forms for the following: (1*5=5 marks)
   a) GNU
   b) ASF
   c) IDT
   d) NSB
   e) SCOSTA
2. What are the two methods of adoption when a national standard adopts an international standard? (2*2.5= 5marks)
3. What is an operating system? Mention some of the important functions of an operating system? (3+2=5marks)
4. Describe the drivers for adoption of open source software? (5 marks)

SECTION-B
(Attempt all questions)
(4*10=40 marks)

5. Write functions and syntax of following commands: (2*5=10 marks)
   a) ls
   b) mkdir
   c) pwd
   d) cp
   e) cat
6. Elaborate on all the drivers for open source software adoption? (10 marks)
7. Describe the stages of development process of Mozilla? (10 marks)
8. Elaborate the different roles enabled by meritocracy in ASF? (10 marks)

SECTION-C
(Attempt all questions)
(2*20=40 marks)

9. Suppose if you want to be part of open source projects, what are the steps you will follow for contribution towards open source projects? (20 marks)
10. What do you understand by the term booting? Explain the linux booting process? (5+15=20 marks)

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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech CSE - CSF/IoT/CCvT/G&G/MT/MC/BAO/OSOS/Devops/CS+LLB/IFM/ECRA/BFSI/BD/OG

Subject (Course): Programming and Data Structures | **Semester – Ist**
Course Code : CSEG1002 | **Max. Marks : 100**
No. of page/s: 02 | **Duration : 3 Hrs**

Section A

Attempt all questions. Each carries equal marks. **[5x4=20 Marks]**

1. What are translators? Explain the difference between compiler and an interpreter.

2. Write a program to input an array and pass the array into a function named "array_func" as a parameter and print the elements of an array on the screen in function definition of "array_func".

3. Write a program of factorial using recursion.

4. Explain step by step procedure of bubble sort method with the help of example.

Section B

Attempt all questions. Each carries equal marks. **[5x8=40 Marks]**

5. Explain the functionality of bitwise AND, bitwise OR and bitwise NOT operator. Write the program to count number of 1s in binary equivalent of an integer number entered by the user at run time.

6. Write a single program to write "hello dear how are you ?" on a file named "file1.txt" and then replace the "dear" with "jini" and print the updated content of the file named "file1.txt" that is "hello jini how are you?" on the output screen.

7. What is the difference between call by value and call by reference method? Write a program of swapping two integers using call by value and call by reference method.

8. Explain step by step procedure of binary search method with the help of example. Write the program to input an integer array in sorted order by the user at run time and search a number using binary search method.

9. Write a note on the following: -
   i) Continue
   ii) Break
   iii) Static
   iv) Extern

Section C

Attempt all questions. Each carries equal marks **[2x20=40 Marks]**

10. What is dynamic memory allocation? Write a program to create a structure for maintaining the student record with data as roll number, name and percentage of marks of the student. Now dynamically allocate the memory to the structure for entering 'n' records where 'n' is any user defined number. And display the records on the screen. What will be the size of the following structure on 32-bit machine and why?

```
struct abc{
        int a;
        char b[21];
        int c;
        };
```

(4+8+8)

11. Write the program (including main function) to implement the singly linked list with the data field as character array, integer and double type representing the name, roll number and percentage of marks of the student with the following operations (separate function for each operation): -
   i) Insertion from the end
   ii) Deletion from the beginning
   iii) Traversing

OR

Write the program (including main function) to implement the doubly linked list with the data field as integer type with the following operations (separate function for each operation): -
i) Insertion
ii) Deletion
iii) Traversing

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UPES **UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

End Semester Examination, Dec-2017

Program Name: B. Tech- CS (CCVT, OGI, Big Data, OSS) **Semester – I**

Course Name : Physics **Max. Marks : 100**

Course Code : PHYS 1002 **Duration : 3 Hrs**

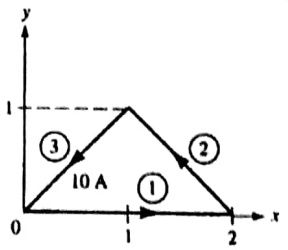
No. of page/s: 2

Instructions:
All questions are compulsory.
Question numbers to be written very clearly.
All highlighted representations are vectors.

SECTION A (All parts are compulsory)

1.	Convert point (1, 4, -3) to spherical coordinates.	[4]	CO2
2.	State and explain Faraday's law.	[4]	CO3
3.	Calculate, Plot and analyze Galilean velocity addition (u_g) and relativistic velocity addition (u_r) in terms of c v/s u', for given u' = 0.25c, 0.5c, 0.75c and c, when v = 0.75c, where *c* is the velocity of light.	[4]	CO4
4.	Deduce an expression for the numerical aperture of a given optical fiber.	[4]	CO1
5.	Obtain the relation between group velocity and phase velocity.	[4]	CO5

SECTION B (Question 9 has internal choice)

6 (a)	As determined by O', a lightning bolt strikes at $x'=60$m, $y'=z'=0$ and $t'=8\times10^{-8}$ s. O' has a velocity of 0.6c along x-axis of O. What are the space-time co-ordinates of the strike as determined by O?	[5]	CO4
6 (b)	The refractive indices of core and cladding of a optical fiber are 1.465 and 1.460, respectively and the light of wavelength 1.25μm is used. What should be the diameter of core for single mode propagation? If the core diameter is given as 50 μm, how many modes can propagate through the fiber?	[5]	CO2
7. (a)	The conducting triangular loop in the given figure carries a current of 10 A. Find **H** at (0, 0, 5) due to the side 1 of the loop. 	[5]	CO3
7. (b)	At what temperature, the ratio of spontaneous and stimulated coefficients are equal. Assume the wavelength to be 5000 Å.	[5]	CO1
8	Derive an expression for Compton shift. Why is the Compton effect not observed with visible light?	[8+2]	CO5
9	(a) Explain the construction process involved in the development of a hologram.	[5]	CO1

	(b) Plane z = 0 and z = 4 carry current $\boldsymbol{K} = -10\boldsymbol{a}_x\, A/m$ and $\boldsymbol{K} = 10\boldsymbol{a}_x\, A/m$, respectively. Determine **H** at (a) (1, 1, 1) and (b) (0, -3, 10).	[5]	CO3
	OR		
	(a) Describe the working of a Ruby Laser by drawing the energy level diagram.	[5]	CO1
	(b) A circular loop located on $x^2 + y^2 = 9, z = 0$ carries a direct current of 10 A along $\boldsymbol{a}_\phi$. Determine **H** at (0, 0, 4) and (0, 0, -4).	[5]	CO3
	SECTION C (Question 11 has internal choice)		
10 (a)	What are boundary conditions? Show that the tangential component of electric field is continuous and the normal component of electric displacement is discontinuous when charge density at surface i.e. $\rho_s \neq 0$.	[2+8]	CO2
10 (b)	The uncertainty in the momentum Δp of a football thrown by Tom during the superbowl traveling at $40 m/s$ is 1×10^{-6} of its momentum. Given Mass = 0.40kg. There is 2 mL of water traveling on the football at the same speed and Δp. Calculate its Δx.	[10]	CO1
11	(a) The density of gold is 19.3×10^3 kg/m^3 in a frame S that is at rest. Calculate its density that an observer in frame S′ would determine if the frame S′ is moving along the X-axis with a speed 0.9c.	[10]	CO4
	(b) Derive the Schrodinger's wave equation in time independent form. Explain physical significance of the wave function	[10]	CO5
	OR		
	(a) An airplane is moving with respect to the earth with a speed of 600 m/s. As determine by earth clocks, how long will it take the airplanes clock to fall behind by two microseconds?	[10]	CO4
	(b) An electron is trapped in a one-dimensional potential box; obtain the expression for the Energy and wave function.	[10]	CO5

Values of constants:

Constant	Standard Values
Planck's Constant (h)	6.63×10^{-34} Joule-sec
Permittivity of free space (ε_0)	8.854×10^{-12} Farad/meter
Velocity of Light c	3×10^8 m/sec
Boltzmann constant (k_B)	1.38×10^{-23} J K^{-1}
Rest mass of an Electron	9.11×10^{-31} Kg
Charge of electron	1.6×10^{-19} C

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UNIVERSITY OF PETROLEUM & ENERGY STUDIES

End-Term Examination – December, 2017

Program/Course : B.Tech (CIT: CCVT, GG, MFT, MC, OSS, SCF, IOT, OG, CYBER LAW, BIG DATA, DevOps)

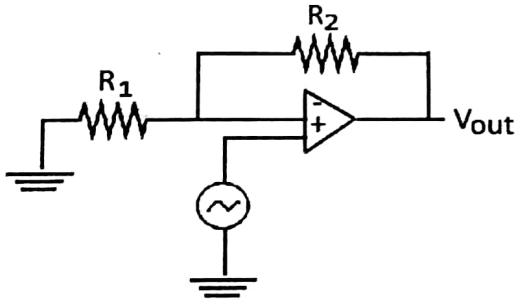
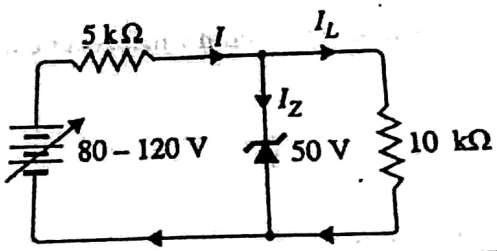
Subject: Basic Electronics Engineering | **Semester : I**

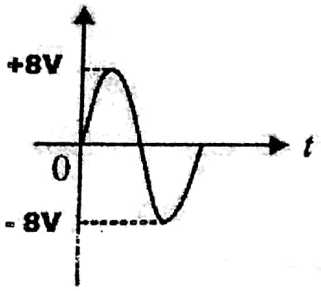
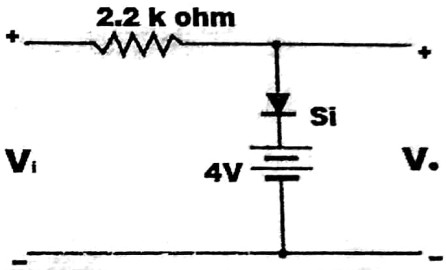
Code : PHYS1003 | **Max. Marks : 100**

No. of page/s: 02 | **Duration : 3 Hrs**

Instructions:

1. **Draw suitable circuit diagrams wherever required to justify your answer.**
2. **Your answer should be concise and to the point.**

	Section A (All questions are compulsory)		
1.	Explain the formation of depletion region in a P-N junction diode.	[4]	CO1
2.	Draw the circuit diagram for n-p-n transistor in C-E configuration. Explain why C-B configuration is not preferred for transistor to be used as current amplifier?	[4]	CO3
3.	Define the term "Slew Rate" and "CMRR" in contest with Operational Amplifiers.	[4]	CO4
4.	Write a brief note on signal to noise ratio in context to communication system. (maximum 60 words)	[4]	CO5
5.	What do you mean by Amplitude modulation? What are its limitations?	[4]	CO5
	Section B (All questions are compulsory. Question no. 9 has internal choice)		
6.	Derive an expression for the output voltage for an Op-amp Adder in inverting mode. Calculate the output voltage from the non-inverting amplifier circuit shown in figure below for an input of 120μV. Given, R_1=2.4 kΩ and R_2 = 240 kΩ. Also calculate the current in resistance R_1. 	[5+5]	CO4
7.	Analyze the circuit shown below to determine the range of Zener current for keeping a constant voltage across the load resistance. 	[10]	CO2

8.	What is feedback process in transistor amplifiers? What are negative and positive feedbacks and derive their respective expressions for voltage gain? Explain the advantage of negative feedback used in amplifiers.	[2+6+2]	CO4
9.	What is a load line and explain its importance? In C-E configuration if V_{CC} =10 V, R_L= 8 kΩ, draw the d.c. load line. What will be the Q point if zero signal base current is 12 μA and β=40? OR Explain the construction and working of JFET. Give some differences between JFET and Bipolar Junction Transistor.	[10]	CO3
	Section C (Question 10 is compulsory. Question 11 has internal choices.)		
10.	a) A copper wire of 2 mm diameter with conductivity of 5.8 x 10^2 Siemens/m and electron mobility of 0.0032 m^2/V-s is subjected to an electric field of 2 x 10^{-2}V/m. Find (a) the charge density of free electrons, (b) the current density, (c) the current flowing in the wire, (d) the electron drift velocity. Given charge on an electron = 1.6 x 10^{-19} C.	[10]	CO1
	b) Write down the steps for determining the output waveform of unbiased positive Clampers? Analyze the circuit shown below to determine the output waveform.  	[5+5]	CO2
11. (a)	(i) What is an Op-amp Integrator? Derive an expression for the output voltage for an Op-amp Integrator. Draw the output sketch of an Integrator Op-amp circuit if the input is a square wave signal having both positive and negative halves.	[2+5+3]	CO4
	(ii) What is modulation and modulation index? Explain the need of modulation in communication system? The maximum peak to peak voltage of AM wave is 40 mV and minimum peak to peak voltage is 10 mV. Calculate the modulation factor.	[3+4+3]	CO5
	OR		
11. (b)	(i) A three stage Op-amp circuit is required to provide voltage gains of +10, -18 and -27. Design the Op-amp circuit. Use a 270 kΩ feedback resistor for all the three circuits. What output voltage will result for an input of 150μV?	[10]	CO4
	(ii) What is a radio receiver? Discuss the Amplitude Modulation superhetrodyne receiver by explaining the function of each stage with the help of a block diagram.	[2+8]	CO5