UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

THE NATION BUILDING UNIVERSITY

Mid Semester Examination – September, 2016

Program/course: B. Tech. CS+ALL IBM
Subject: Programming and Data Structure
Code : INFO 117
No. of page/s: 2

Semester – 1
Max. Marks : 100
Duration : 2 Hrs.

Section A: All questions are mandatory. Each question carries 5 marks.

1. Draw equivalent flow charts and write syntax of FOR and Do-WHILE control construct in C Language. Make suitable assumptions.
2. Compare the different storage class specifiers in C Language on Life, Scope, Initial Value and Storage Location of variables.
3. Specify key differences between:
   a. Compiler and interpreter
   b. **return** and **break** statements.
4. Demonstrate the structure of a C Program while calculating area of a circle. Use **scanf** to read radius. Also distinguish between declaration and definition.

Section B: All questions are mandatory. Each question carries 12 marks.

5. Demonstrate the application of different bit-wise operations on integer operands. Apply taking **int x =16, y =15;**

   or

   Demonstrate through pseudo code and C language code to identify all the prime numbers in the range 1-1000.
6. Suppose we have to count the number of visitors in UPES since morning today. Codify a C program to meet our requirements. Program should ask the user, whether a new visitor arrived. If user answer 'Y' or 'y' then program should increment the visitor count. If user answer 'N' or 'n' then program should display the total visitor count. Perform increment operation in a separate function.
7. Demonstrate the procedure to convert an integer number into its binary equivalent by using a recursive function.
8. Devise a C program to print element at index number 1,2,4,8,16,32,64 in an array of 100 integer elements.

9. Let a number is palindrome if reversing the digits of a number gives same value as the original number's value. Identify a control construct which suits best to this scenario. Propose a solution in C Language to check whether a number is palindrome or not.

Section C: All questions are mandatory. Each question carries 20 marks.

10. (i) Consider following income tax slabs:
    a. If Income is less than equal to 250000, then no tax to be paid in this slab.
    b. If Income is greater than 250000 but less than or equal to 500000, then tax is 10% for this slab.
    c. If income is greater than 500000 but less than or equal to 1000000 then tax is 20% for this slab.
    d. If income is greater than 1000000 then tax is 30 % for this slab.

Apply control constructs in C which supports many-to-one decisions and propose a C Implementation for Tax computation of an Indian individual. Your implementation should take gross salary as input and produce tax to be paid as output.

For e.g.; if input is rupees 13, 50000, then output should be rupees 2, 30,000.

(ii) Apply looping constructs in C-Language for generation of following pattern.

```
***1***

**121**

*12321*

1234321
```

Or

(i) Propose a solution by using C language to print the element of an integer array in reverse order without altering the order of elements.

(ii) Write a C-Program to reverse the order of elements in an integer array and then print the elements in original order.

SEM-I IOT &SC

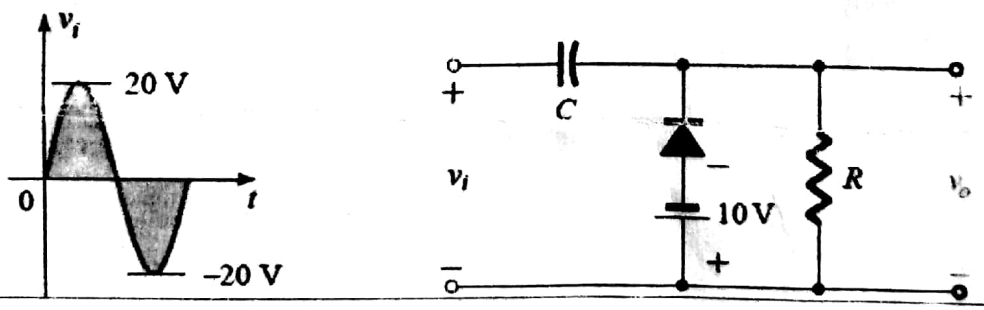
UNIVERSITY OF PETROLEUM & ENERGY STUDIES

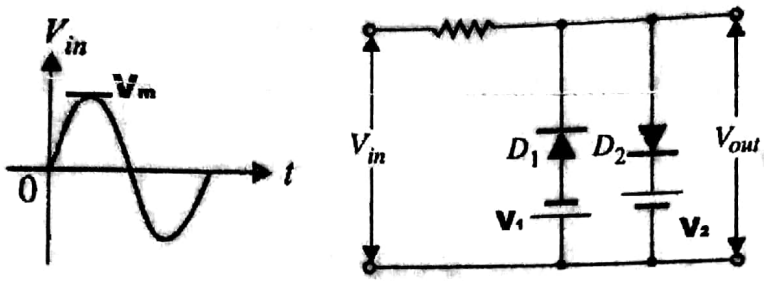
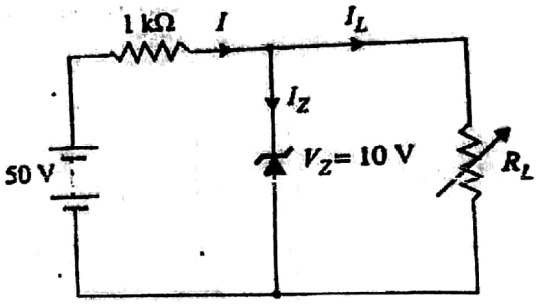
Mid-Term Examination – October, 2017

Program/Course : B.Tech (CIT: CCVT, GG, MFT, MC, OSS, SCF, IOT, OG, CYBER LAW, BIG DATA, DevOps)
Subject: Basic Electronics Engineering
Code : PHYS1003
No. of page/s: 02

Semester : I
Max. Marks : 100
Duration : 2 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.	Write a brief note on charge neutrality equation in semiconductors.	[4]	CO1
2.	Briefly explain the effect of biasing on the width of depletion layer of PN junction diode.	[4]	CO1
3.	A silicon p-n junction diode having internal forward resistance $R_f = 20\Omega$ is used for half-wave rectification. If the applied input voltage is $V = sin\omega t$ and load resistance $R_L = 2000\Omega$, find the d.c. output current (I_{dc}) and the effective output current (I_{rms}).	[4]	CO2
4.	Draw the energy band diagram of intrinsic and extrinsic semiconductor with fermi level.	[4]	CO1
5.	Calculate the base current if direct current gain (α) in common base circuit of transistor is 0.96 and emitter current is 2 mA.	[4]	CO3
	Section B (All questions are compulsory. Question no. 9 has internal choice)		
6.	What is a rectifier? Discuss the working of a full wave bridge rectifier and mention its advantages over center tapped full wave rectifiers.	[10]	CO2
7.	a) The diode current is 0.5 mA at 340 mV and 15 mA at 440 mV. Determine the value of η (ideality factor) assuming kT/q = 25 mV. b) Find the intrinsic carrier concentration of Germanium if its intrinsic resistivity at 300K is 0.47Ω.m. It is given that the electronic charge is 1.6×10^{-19} Coulomb and the electron and hole mobilities at 300K are 0.39 and 0.19 m^2/volt.sec respectively.	[5+5]	CO1
8.	Discuss the action of a n-p-n transistor as in common-emitter configuration with the help of a circuit diagram. Also draw the input and output characteristics and derive a relation between the two current gains.	[10]	CO3
9.	Solve the given clamper network to draw its output waveform. 	[10]	CO2

	OR Solve the given clipper circuit consisting to draw its output waveform assuming diode terminal voltage as V_T. 		
	Section C (Question 10 is compulsory. Question 11 has internal choices.)		
10.	a) For the given circuit, determine the range of load resistance R_L that will result in a constant voltage of 10 V across R_L. Given I_{ZM} = 32 mA 	**[10]**	**CO2**
	b) What is a filter circuit? Explain the working of L-section and π-section filter circuit long with the suitable circuit diagram.	**[10]**	**CO2**
11. (a)	A sample of intrinsic silicon has electron and hole mobilities as 0.13 and 0.05 $m^2/V\text{-}s$ respectively at 300K. If the density of electrons and holes are each equal to 1.5×10^{16} m^{-3} at 300K find the electrical conductivity for addition of 1 donor impurity atom in 10^9 silicon atoms. Given that the density of Si atoms is 5.0×10^{22} cm^{-3}. **OR** Differentiate between Avalanche and Zener breakdown in p-n junction diode. Discuss the effect of temperature on Avalanche and Zener breakdown voltages.	**[10]** **[10]**	**CO1** **CO1**
11. (b)	Explain the construction and working of Junction Field Effect Transistor (JFET) with the help of suitable diagram. **OR** Discuss the construction and working of depletion type Metal Oxide Semiconductor Field Effect Transistor (D-MOSFET) with the help of suitable diagram.	**[10]** **[10]**	**CO3** **CO3**

UPES **UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

Mid Semester Examination, March-2018

Program Name: B. Tech (CIT courses) **Semester – II**

(CS-BFSI, BAO, CL, ECRA, DEVOPS, IFM, IOT, CSF, MFT, GG, MC)

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

Course Code : PHYS 1002 **Duration : 2 Hrs**

No. of page/s: 2

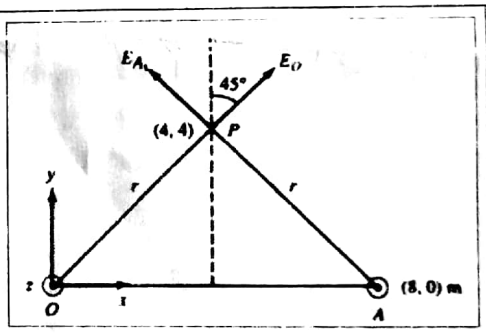
Instructions:
All questions are compulsory.
Question numbers to be written very clearly.
All highlighted representations are vectors.

SECTION A (All Questions are compulsory)

1	Differentiate a Laser source from that of an ordinary light source.	[5]	CO1
2	A signal of power 8 μW exists just inside the entrance of 0.5 km long fiber. Calculate the absorption coefficient of the fiber if the power inside the fiber be 2 μW.	[5]	CO2
3	State and explain Gauss's law by establishing the integral and differential forms.	[5]	CO1
4	Derive an expression for magnetic field due to an Infinite line current by using Ampere's Law.	[5]	CO3

SECTION B

(All Questions are compulsory with an internal choice in Question 8)

5	(a) Two straight non-conducting wires, parallel to the z-axis, pass through points O and A, as shown in figure below. The wires carry equal and uniform charge density 0.4 μC/m. Determine the electric field at point P. 	[5]	CO3
	(b) Explain Biot-Savart's Law.	[5]	CO1
6	(a) Derive the current continuity equation and explain its significance.	[5]	CO3
	(b) Determine the value of constant 'a' so that the vector $\boldsymbol{V} = (x + 3y)\boldsymbol{a_x} + (y - 2z)\boldsymbol{a_y} + (x + az)\boldsymbol{a_z}$ is a solenoidal.	[5]	CO3
7	(a) Explain the advantages of optical fiber communication system.	[5]	CO3
	(b) Explain the construction process involved in the development of a Hologram.	[5]	CO3

8	(a) Derive Einstein's coefficients for absorption, spontaneous emission and stimulated emission. Obtain a relation between them. (OR) (b) Calculate the population ratio of two states in He- Ne Laser that produces light of wavelength 6000 Å at (i) 300 K and (ii) 500K (iii) 1000K?	[10] [10]	CO2 CO2

SECTION C

(All Questions are compulsory with an internal choice in Question 10)

9	(a) Explain the construction and working of He-Ne laser with energy band diagram. (b) A multimode step index fiber has a core diameter of 80 μm and relative refractive index difference of 1.5% is operating at a wavelength of 0.85 μm. If the core refractive index is 1.48, calculate (i) The normalized frequency of the fiber. (ii) The maximum number of guided modes.	[10] [10]	CO3 CO2
10	(a) Calculate the elctric field due to an infinite line charge by using Coulomb's law. (b) Show that the tangential component of the electric field is continuous and the normal component of electric field is discontinuous when non zero charge density at surface exists($\rho_s \neq 0$) (OR) (a) Explain the polrization in dielectrics to derive the volume and surface charge densities. (b) A circular disk of radius a is uniformly charged with ρ_s C/m^2. The disk lies on the $z = 0$ plane with its axis along the z-axis. Show that at a point (0, 0, h), $\boldsymbol{E} = \frac{\rho_s}{2\epsilon_0}\left\{1 - \frac{h}{[h^2+a^2]^{\frac{1}{2}}}\right\} \boldsymbol{a_z}$	[10] [10] [10] [10]	CO2 CO4 CO2 CO4

Values of constants:

Constant	Standard Values
Planck's Constant (h)	6.63 x 10^{-34} Joule-sec
Permittivity of free space (ε_0)	8.854 x 10^{-12} Farad/meter
Velocity of Light c	3 x 10^{8} m/sec
Boltzmann constant (k_B)	1.38 x 10^{-23} J K^{-1}
Mass of an Electron	9.11 x 10^{-31} Kg
Charge of electron	1.6x10^{-19} C

Roll No: R103216011

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Mid Semester Examination – Sep., 2016

Program/course: B.Tech. (All CIT Branches) | **Semester – I**
Subject: Mathematics I | **Max. Marks : 100**
Code : MATH-113 | **Duration : 3Hrs**
No. of page/s: 2

Note: All sections are compulsory

SECTION A
(Attempt all Questions) **(4× 5 = 20)**

1. Find the n^{th} derivative of $\dfrac{x^2}{(x+2)(2x+3)}$.

2. If $\theta = t^n e^{-\frac{r^2}{4t}}$, what value of n will make $\dfrac{1}{r^2}\dfrac{\partial}{\partial r}\left(r^2\dfrac{\partial\theta}{\partial r}\right)=\dfrac{\partial\theta}{\partial t}$?

3. Evaluate $\int_0^1\int_0^{\sqrt{1+x^2}}\dfrac{dx\,dy}{1+x^2+y^2}$.

4. By changing the variables in polar coordinates, evaluate $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}dx\,dy$.

SECTION B
(Attempt all Questions) **(5× 12 = 60)**

5. If $y=\sin\left(m\sin^{-1}x\right)$, prove that $\left(1-x^2\right)y_{n+2}-\left(2n+1\right)x\,y_{n+1}-n^2y_n=0$ and hence find $y_n(0)$.

6. If $u=\sin^{-1}\left(\dfrac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, then find $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}$ and $x^2\dfrac{\partial^2u}{\partial x^2}+2xy\dfrac{\partial^2u}{\partial x\partial y}+y^2\dfrac{\partial^2u}{\partial y^2}$.

7. Evaluate the integral $I=\iint_R x^2y\,dy\,dx$, where R is the region bounded by the lines $y=0$, $x+y=2$ and the curve $y=x^2$.

8. By changing the order of integration, evaluate $\int_0^a \int_{\frac{y^2}{a}}^{y} \frac{y\,dx\,dy}{(a-x)\sqrt{ax-y^2}}$.

9. Discuss the extreme values of the given function $f(x,y)=x^3+y^3-3axy$, $a>0$.

OR

Evaluate $\iiint \frac{dx\,dy\,dz}{\sqrt{1-x^2-y^2-z^2}}$, the integral being extended to the positive octant of the sphere $x^2+y^2+z^2=1$.

SECTION C **(1× 20 = 20)**

10.

(A)

(i) If $u^3+v^3+w^3=x+y+z$, $u^2+v^2+w^2=x^3+y^3+z^3$, $u+v+w=x^2+y^2+z^2$, then find the Jacobian of u,v,w with respect to x,y,z.

(ii) Find the volume bounded by the cylinder $x^2+y^2=4$ & the planes $y+z=4$ and $z=0$.

OR

(B)

(i) If $u=3x+2y-z, v=x-2y+z$, and $w=x(x+2y-z)$, check, they are functionally related or not ? If yes, then find the relation between them.

(ii) Using the transformation $u=x+y$ and $v=x-2y$, evaluate $\iint_R (x^2+2xy+y^2)(x-2y)\,dx\,dy$ where R is the parallelogram in the xy-plane with vertices $(1,0),(3,1),(2,2)$ and $(0,1)$.

SEM-I 10T&SC

Name:	
Enrolment No:	R 164217061

Course: MATH 1002 – Mathematics I
Programme: B.Tech. (All SoCSE Branches)
Semester: I (ODD-2017-18)
Time: 02 hrs. **Max. Marks:100**

Instructions:
Attempt all questions from **Section A** (each carrying 4 marks); attempt all questions from **Section B** (each carrying 10 marks); attempt all questions from **Section C** (each carrying 20 marks).

Section A
(Attempt all questions)

1.	If $V = \frac{x^3y^3}{x^3+y^3}$, prove that $x\frac{\partial V}{\partial x} + y\frac{\partial V}{\partial y} = 3V$.	[4]	CO1
2.	Evaluate $\iint_R y\,dx\,dy$, where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$.	[4]	CO1
3.	Find the n^{th} derivative of $\frac{1}{1-5x+6x^2}$.	[4]	CO1
4.	If p be "He is rich" and q be "He is Generous". Write in simple sentences the meaning of the following: $(i) \sim p$ (ii) $\sim (p \vee q)$ (iii) $p \rightarrow q$ (iv) $\sim p \wedge \sim q$	[4]	CO2
5.	Use truth table to show that $p \rightarrow q \equiv \sim p \vee q$	[4]	CO2

SECTION B
(Q6-Q8 are compulsory and Q9 has internal choice)

6.	If $\cos^{-1}\left(\frac{y}{b}\right) = \log\left(\frac{x}{m}\right)^m$, then prove that $x^2y_{n+2} + (2n+1)xy_{n+1} + (n^2+m^2)y_n = 0$	[10]	CO1
7.	Find the volume bounded by the cylinder $x^2 + y^2 = 4$ and the planes $y + z = 4$ and $z = 0$	[10]	CO1
8.	If $u^3 + v^3 + w^3 = x + y + z$, $u^2 + v^2 + w^2 = x^3 + y^3 + z^3$, $u + v + w = x^2 + y^2 + z^2$, then show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = \frac{(x-y)(y-z)(z-x)}{(u-v)(v-w)(w-u)}$. Final Ans.	[10]	CO1

9.	Using the truth table, obtain the principal disjunctive normal form of the following: (i) $p \wedge (p \rightarrow q)$ (ii) $q \vee (p \vee \sim q)$ **OR** Show that the following statement is a tautology using truth table $((p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)) \rightarrow r$	[10]	CO2
	SECTION C **(Q10 is compulsory and Q11A, Q11B have internal choice)**		
10.A	A rectangular box, open at the top, is to have a volume of 32 cc. Find the dimensions of the box requiring the least material for its construction.	[10]	CO1
10.B	Use truth table to prove the distributive law $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$	[10]	CO2
11.A	Change the order of integration in $I = \int_0^1 \int_{x^2}^{2-x} xy \, dy \, dx$ and hence evaluate the same. **OR** Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dz\, dy\, dx}{\sqrt{1-x^2-y^2-z^2}}$	[10]	CO1
11.B	Transform to Cartesian coordinates and hence evaluate $\int_0^{\pi} \int_0^{a} r^3 \sin\theta \cos\theta \, dr d\theta$ **OR** Evaluate $\iint_R [x+y] \, dx \, dy$ over the rectangle $R = [0,\ 1;\ 0,2]$ where $[x+y]$ denotes greatest integer less than or equal to $(x+y)$.	[10]	CO1