2019-20
B. TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
HIGHER MATHEMATICS-I
AM-261

Maximum Marks: 60 **Credits: 04** **Duration: Two Hours**

Answer all questions.
Notations and symbols used have their usual meaning.
Marks allotted to each question and course outcome (CO) covered are indicated against each question.

Q.No.	Question	CO	M.M.

1(a) Show that the function (CO1) [07]

$$f(z) = \begin{cases} \dfrac{xy^2(x+iy)}{x^2+y^4}, & z \neq 0 \\ 0, & z = 0 \end{cases}$$

is not analytic at the origin although C-R equations are satisfied at the origin.

OR

1(a') If ϕ and ψ are functions satisfying Laplace's equation, show that $s + it$ is analytic, where (CO1) [07]

$$s = \frac{\partial \phi}{\partial y} - \frac{\partial \psi}{\partial x} \text{ and } t = \frac{\partial \phi}{\partial x} + \frac{\partial \psi}{\partial y}.$$

1(b) Show that $u(x,y) = 2x - x^3 + 3xy^2$ is harmonic. Find the harmonic conjugate function $v(x,y)$ and the corresponding analytic function $f(z) = u + iv$ in terms of z. (CO1) [08]

2(a) Expand $f(z) = 1/(z+1)(z+3)$ in a Laurent's series valid for (i) $|z| > 3$ (ii) $1 < |z| < 3$. (CO2) [07]

2(b) Using contour integration, evaluate the integral (CO2) [08]

$$\int_C \frac{e^z - 1}{z(z-1)(z-i)^2} dz, \text{ where } C \text{ is } \left|z - {}^{i}/_{2}\right| = 1.$$

contd ....2.

OR

2(b') Evaluate the following integral by contour integration (CO2) [08]

$$\int_0^{2\pi} \frac{d\theta}{(5-3\sin\theta)^2}.$$

3(a) Find the directional derivative of $f(x,y,z) = x^2 - 2y^2 + 4z^2$ at the point $(1,1,-1)$ in the direction of $2\hat{\imath} + \hat{\jmath} - \hat{k}$. (CO3) [07]

OR

3(a') Prove that div (grad r^n) $= n(n+1)r^{n-2}$, where $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$. (CO3) [07]

3(b) Show that the vector field $\vec{v} = (y^2 - x^2 + y)\hat{\imath} + x(2y+1)\hat{\jmath}$ is irrotational and find a scalar function f such that $\vec{v}$ =grad f. (CO3) [08]

4(a) Find the work done by the force $\vec{F} = -xy\hat{\imath} + y^2\hat{\jmath} + z\hat{k}$ in moving a particle over the circular path $x^2 + y^2 = 4, z = 0$ from (2, 0, 0) to (0, 2, 0). (CO4) [07]

4(b) Verify divergence theorem for $\vec{F} = 4xz\hat{\imath} - y\hat{\jmath} + yz\hat{k}$ taken over the cube bounded by the planes $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. (CO4) [08]

OR

4(b') Find the value of integral $\iint_S (\nabla \times \vec{F}).\hat{n}\, dS$ taken over the upper portion of the surface $x^2 + y^2 - 2ax + az = 0$ and the bounding curve lies in the plane $z = 0$, when (CO4) [08]

$$\vec{F} = (y^2 + z^2 - x^2)\hat{\imath} + (z^2 + x^2 - y^2)\hat{\jmath} + (x^2 + y^2 - z^2)\hat{k}.$$

2019-20
B. TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
HIGHER MATHEMATICS
AMS-2610

Maximum Marks: 60 **Credits: 04** **Duration: Two Hours**

Answer all questions.
Notations and symbols used have their usual meaning.
Marks allotted to each question and course outcome (CO) covered are indicated against each question.

Q.No.	Question	CO	M.M.
1(a)	Show that the function $$f(z)=\begin{cases}\frac{\bar{z}^2}{z}, & z\neq 0\\ 0, & z=0\end{cases}$$ satisfied Cauchy-Riemann equations at origin. Does $f'(0)$ exist?	(CO1)	[07]
1(b)	Show that $v(x,y)=\ln(x^2+y^2)+x+y,\ z\neq 0$ is harmonic. Find the corresponding conjugate harmonic function $u(x,y)$ and construct the analytic function $f(z)=u+iv$.	(CO1)	[08]
	OR		
1(b')	Find the analytic function $f(z)=u+iv$ if $u+v=\frac{x}{x^2+y^2}$ and $f(1)=1$.	(CO1)	[08]
2(a)	Find the Laurent's series of the function $$f(z)=\frac{7z-2}{z^3-z^2-2z}$$ valid for (i) $\lvert z+1\rvert>3$ (ii) $1<\lvert z+1\rvert<3$.	(CO2)	[07]
2(b)	Evaluate the following integrals: (i) $\int_C e^{\frac{1}{(z-2)^3}}dz$, where C is $\lvert z\rvert=1$, (ii) $\int_C \frac{12z-7}{(z-1)^2(2z+3)}dz$, where C is $\lvert z\rvert=2$.	(CO2)	[08]

Contd....2.

OR

2(b') Evaluate the following integral by contour integration (CO2) [08]

$$\int_0^{\infty} \frac{dx}{x^6+1}.$$

3(a) Find the directional derivative of $\phi = x^2 - y^2 + 2z^2$ at the point $P(1,2,3)$ in the direction of the line PQ, where Q is the point $(5, 0, 4)$. In what direction will it be maximum? Find the maximum value of it. (CO3) [07]

OR

3(a') Prove that $r^n\vec{r}$, where $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$, is solenoidal only if $n + 3 = 0$. (CO3) [07]

3(b) Show that the vector field $\vec{v} = (2xy + z^2)\hat{\imath} + (2yz + x^2)\hat{\jmath} + (2xz + y^2)\hat{k}$ is irrotational and find a scalar function f such that $\vec{v}$ =grad f. (CO3) [08]

4(a) Find the work done by the force $\vec{F} = z\hat{\imath} + x\hat{\jmath} + y\hat{k}$ in moving a particle along the arc of the curve $\vec{r} = \cos t\,\hat{\imath} + \sin t\,\hat{\jmath} + t\hat{k}$ from $t = 0$ to $t = 2\pi$. (CO4) [07]

4(b) Use divergence theorem to evaluate $\iint_S \vec{F} \cdot \hat{n}\, dS$, where $\vec{F} = 4x\hat{\imath} - 2y^2\hat{\jmath} + z^2\hat{k}$ and S is the surface bounding the region $x^2 + y^2 = 4,\ z = 0,\ z = 3$. (CO4) [08]

OR

4(b') Verify Green's theorem in the plane for (CO4) [08]

$$\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy,$$

where C is the boundary of the region bounded by $x = 0, y = 0, x + y = 1$.

2019-20
B.TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
OBJECT ORIENTED PROGRAMMING
COC2030/CO203

Maximum Marks: 60 **Credits: 04** **Duration: Two Hours**

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.	Question	CO	M.M.
1(a)	Compare Object Oriented and Functional programming languages?	CO1	[5]
1(b)	What is data hiding in Object Oriented Programming? What are the different mechanisms for protecting data from the external users of a class?	CO2	[5]
1(c)	What is Namespace? How are they useful in C++?	CO3	[5]
	OR		
1(c')	What is wrong with this code? Explain each statement. *void f1(char *p)* *{* *char s[] = "Computer";* *const char* pc = s;* *pc[3] = 'g';* *pc = p;* *char *const cp =s;* *cp[3] = 'a';* *cp = p;* *const char *const cpc = s;* *cpc[3] = 'a';* *cpc = p;* *}*	CO3	[5]
2(a)	What are the different forms of inheritance supported by C++? Explain using example.	CO2	[5]
	OR		
2(a')	What are static data member and member functions of a class? When do we declare a member of a class "Static"? How to initialize and access static members of a class?	CO2	[5]
2(b)	What is operator overloading? What are the restrictions that apply to operator overloading?	CO2	[2+3]

2(c)	Can a friend function be used to overload the assignment operator '='? Justify your answer	CO4	[05]
	OR		
2(c')	Can a base class access members of a derived class? Support your answer.	CO4	[06]
3(a)	What is a use class template? Also, create a class template for Stack operations.	CO4	[05]
3(b)	What is dynamic binding in C++? What is a role of compiler in dynamic binding?	CO3	[05]
	OR		
3(b')	What is Run-Time Type Information (RTTI)? What is the role of virtual keyword, dynamic_cast and typeid in RTTI?	CO3	[05]
3(c)	What is exceptions? Why do we need exception handling? Give the syntax of exception in C++.	CO2	[06]
4(a)	Why are Java programs assume to be Robust, Architectural- neutral and Dynamic?	CO2	[05]
4(b)	Compare Java Abstract class and Interface in terms of fields, method, inheritance and root.	CO3	[05]
	OR		
4(b')	What is Java Runtime Environment? How it is different from Java Development Kit (JDK)?	CO3	[05]
4(c)	Can we define virtual constructor in Java? Why is virtual destructor not used in Java?	CO4	[05]
	OR		
4(c')	What are the features of SWING class of Java? Write a program in Java using SWING to construct a window which contains two buttons (EDIT, EXECUTE), a text field and a two check boxes. Arrange all the components using flowlayout.	CO4	[05]
	_____		

2019-20
B.TECH. AUTUMN (III SEMESTER) EXAMINATION
COMPUTER ENGINEERING
DATA STRUCTURE AND ALGORITHM
(COC2060/CO206)

Maximum Marks: 60 **Credits: 04** **Duration: Two Hours**

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No	Question	CO	M.M.
1(a)	Differentiate the pros & cons of array and linked list data structure.	CO1	[03]
1(b)	Arrange the following time-complexities in decreasing order $O(\log(n!))$, $O(n\log n)$, $O(n^{3/2})$, $O(2^{\log n})$, $O(n^{\log n})$ with proper justification.	CO1	[06]
1(c)	Write a function to perform insertion operation in circular queue using array with suitable example.	CO3	[06]
	OR		
1(c')	Write a function to delete a node after a given node in linked list with suitable example.	CO3	[06]
2(a)	Write the pseudo code of Bubble-sort and also discuss the time space complexity.	CO4	[03]
2(b)	Sort the following list of number using heap sort. 25 57 48 37 12 92 86 33	CO3	[06]
2(c)	Describe an algorithm for Merge sort and also sort the following array of numbers. 9 39 45 81 18 27 72 90	CO3	[06]
	OR		
2(c')	Describe an algorithm for Selection sort and also sort the following array of numbers. 39 9 81 45 90 27 72 18	CO3	[06]
3(a)	Convert the following infix expression into postfix expression showing all the steps involved: A – (B / C + (D % E * F) / G)* H)	CO2	[06]

contd....2.

3(b) Write a function struct node *insert (struct node *start) to insert a node after a given node in a Doubly Linked List. Given the node in list as: CO2 [09]

```
struct node
    {
     struct node *next;
     int data;
     struct node *prev;
    };
```

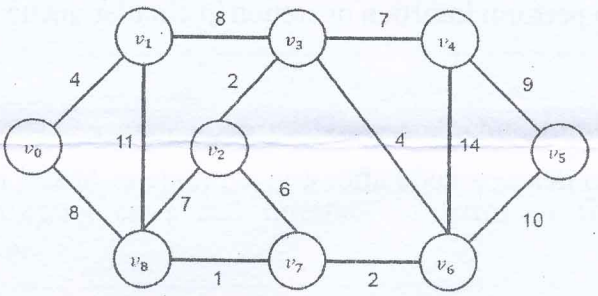
4(a) The Inorder and Postorder traversal of a binary tree is given below: CO4 [06]

Inorder: D B F E A G C L J H K

Postorder: D F E B G L J K H C A

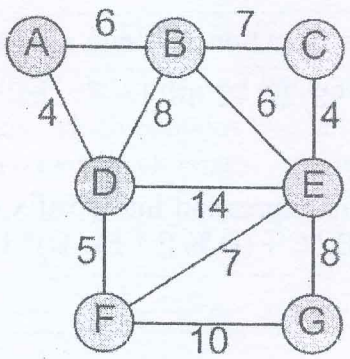
Construct the binary tree from above information.

4(b) Using Prim's Algorithm, find the cost of minimum spanning tree (MST) of the given graph- CO4 [09]



OR

4(b') Using Kruskal's Algorithm, find the minimum spanning tree (MST) of the given graph- CO4 [09]



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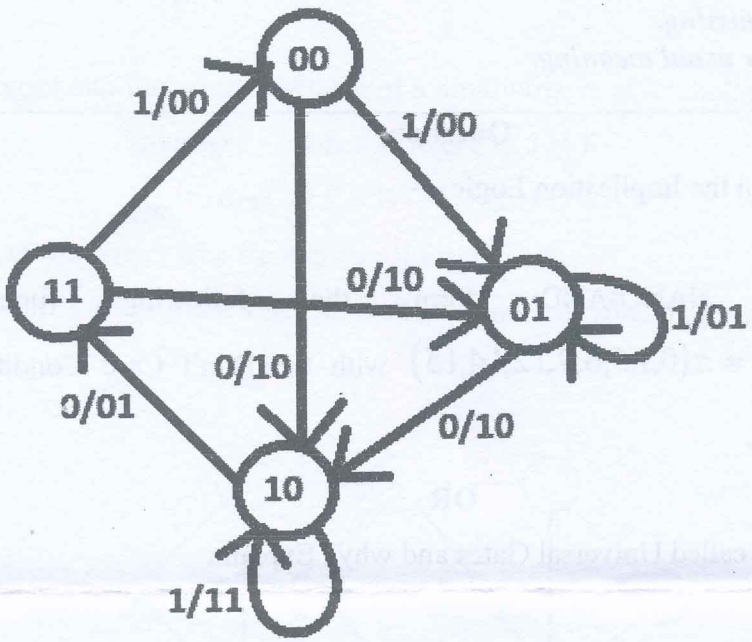
2019-20
B.TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
DIGITAL LOGIC AND SYSTEM DESIGN
COC-2070/CO-207

Maximum Marks: 60 **Credits: 04** **Duration: Two Hours**

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.	Question	CO	M.M.
1(a)	State and explain the Implication Logic.	CO1	[5]
1(b)	Realize in NAND-AND form the following function: $F(A,B,C,D)=\pi(0,1,5,6,7,12,14,15)$ with the Don't Care Conditions being $\phi(2,4,8)$.	CO1	[10]
	OR		
1'(a)	Which gates are called Universal Gates and why? Explain.	CO1	[5]
1'(b)	Subtract $(34012.011)_5$ from $(10102.32)_4$ using r's complement method, where $r = 8$. Express your final result in binary in 2's complement form.	CO1	[10]
2(a)	Discuss the design of an Even/Odd Parity Generator/Checker System.	CO2	[5]
2(b)	Realize a Full Subtractor using a PLA. Draw the PLA Program Table and also sketch its Logic circuit.	CO2	[10]
	OR		
2'(a)	Realize a Full Adder using a ROM.	CO2	[5]
2'(b)	Sketch and explain the logic diagram of a BCD Adder.	CO2	[10]

contd....2.

3(a)	Sketch and explain the logic diagram of a BCD ripple counter. Using this then, develop the block diagram of a 3-decade decimal BCD counter.	CO3	[7]
3(b)	A sequential circuit has one input and two outputs. The state diagram is shown in the Figure below. Design the sequential circuit with JK flip-flops. 	CO3	[8]
4(a)	Giving suitable examples, differentiate between a Micro-operation and a Macro-operation.	CO4	[5]
4(b)	In the design of an ALU, how can we obtain the different Logic Functions using the Full Adder? Explain.	CO4	[10]

2019-20
B. TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
ELECTRONIC DEVICES & CIRCUITS
ELA-2110/EL-211

Maximum Marks: 60 **Credits: 04** **Duration: Two Hours**

Answer all questions.
Assume suitable data if missing.
Notations and symbols used have their usual meaning.

Q.No.	Question	CO	M.M.
1(a)	Explain the construction and working of Schottky diode. Why it is called hot carrier diode?	(CO1)	[06]
	OR		
1(a')	With the aid of suitable energy band diagrams explain the operation of a Tunnel diode.	(CO1)	[06]
1(b)	For the circuit in Fig. 1, calculate the base current, the collector current, and the collector voltage. If the transistor is saturated, find β_{forced}. What value should R_B be raised to in order to bring the transistor to the edge of saturation?	(CO1)	[06]

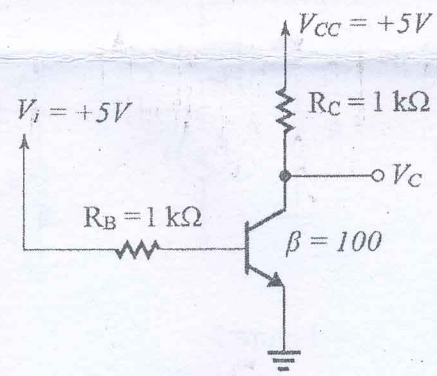


Figure 1

2(b)	Prove that the stability factor $S(V_{BE})$ for the collector-to-base feedback biased circuit shown in Fig. 2 is:	(CO2)	[06]

$$S(V_{BE}) = \frac{dI_C}{dV_{BE}} = -\frac{\frac{\beta}{R_c}}{\beta + 1 + \frac{R_B}{R_c}}$$

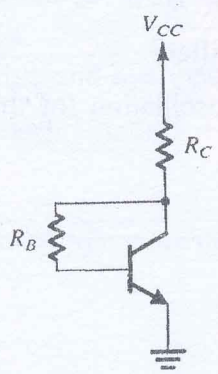


Figure 2

contd... 2.

2(b) What is the need of biasing in MOSFET? Discuss constant-current source biasing scheme used for MOSFET. (CO2) [06]

3(a) Draw the small-signal equivalent model for Common-Collector amplifier. Derive an expression for input resistance (R_{in}), overall voltage gain (G_V) and output resistance (R_o). (CO3) [06]

3(b) A common source amplifier biased at $I_D = 0.25$ mA with $V_{OV} = 0.25$ V and $R_D = 20$ kΩ. The MOSFET has $V_A = 50$ V. The amplifier is fed with a source having $R_{sig} = 100$ kΩ, and a 20 kΩ load is connected at the output. Find R_{in}, R_o and overall voltage gain G_V. (CO3) [06]

OR

3(b') For the circuit shown in Fig. 3 [illegible], $I = 4$ mA, $k_n'(W/L) = 0.5$ mA/V^2, $V_{DD} = -V_{SS} = 12$ V, $V_A = 100$ V, $R_{sig} = 10$ kΩ, $R_G = 10$ kΩ and $R_L = 2$ kΩ. Find the input resistance (R_{in}), output resistance (R_O) and overall voltage gain (G_V).(assume that all capacitances are very large) (CO3) [06]

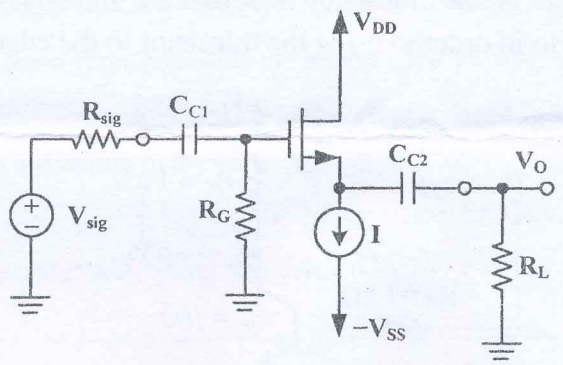


Figure 3

4 Derive an expression to find out the mid-band gain (A_M) and an upper 3dB frequency (f_H) of a common-emitter amplifier. (CO3) [12]

OR

4' Draw the high frequency equivalent circuit of a common-source amplifier and determine the input capacitance C_{in} and upper 3dB frequency f_H. (CO3) [12]

5(a) Explain the concept of negative feedback. How the introduction of negative feedback increases bandwidth of an amplifier? (CO3) [06]

5(b) Derive the frequency and condition of oscillation for the Hartley oscillator circuit using BJT. (CO3) [06]