END SEMESTER EXAMINATION JUNE 2024

Program: T.Y. B.Tech. *Sem VI*   **Duration: Three Hour** 10/6/24

Course Code: PC-BTE601   **Maximum Points: 100**

Course Name: Power System II   **Semester: VI**

Q. No.	Questions	Points	CO	BL	Module No.
1.	Solve any four.				
	a. Discuss briefly objectives of Power system Stability Studies.	05	1,3	1,2	3
	b. Describe briefly objectives of load flow studies.	05	1,2,3	2,3	2
	c. Discuss briefly the objective of Automatic Voltage Regulator.	05	4,5	1,2	4
	d. Discuss briefly objectives of reactive power compensation and list out few methods of compensation.	05	4,5	1,2	6,7
	e. Describe phase shifting transformer.	05	4,5	1,2	7
2.	a. Define the following terms; (One or two lines only) 1. Steady State Stability 2. Dynamic Stability 3. Transient Stability. 4. Synchronizing Coefficient 5. Coherent Machines	10	1,2,3,4,5	1,2	3
	b. Critically analyze the application of Equal Area Criterion, for studying Transient Stability, for sudden loss of one of parallel lines for the system shown below. 	10	1,3	2,3,4	3
3	a. Write *Algorithm* OR *Flow Chart* for Solution of Static Load Flow Equation using Newton Rapson Method.	10	1,2,3	2,3,4	1,2
	b. For the system of below given equations find expression for the Jacobean Matrix and evaluate the Jacobian matrix at $x_1 = 0.1$ $x_2 = 0.1$ $x_3 = -0.1$	10	1,2,3	2,3	1,2
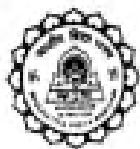
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END SEMESTER EXAMINATION JUNE 2024

$$3x_1 - \cos(x_2 x_3) - \frac{1}{2} = 0$$

$$x_1^2 - 81(x_2 + 0.1)^2 + \sin x_3 + 1.06 = 0$$

$$e^{-x_1 x_2} + 20x_3 + \frac{10\pi - 3}{3} = 0$$

4.	For the sample system shown below the generators are connected to all the four buses, while the loads are at buses 2 and 3. Values of real and reactive powers are listed in Table. All buses other than slack are PQ type. Assuming a flat voltage start, find the voltages and bus angles at the three buses at the end of first Gauss-Siedel iteration. Consider dotted line between buses 1-2 as connected.	20	1,2,3	1,2,3,4	1,2

Use Y_{BUS} given below for calculations.

$$Y_{BUS} = \begin{bmatrix} 3 - j9 & -2 + j6 & -1 + j3 & 0 \\ -2 + j6 & 3.666 - j11 & -0.666 + j2 & -1 + j3 \\ -1 + j3 & -0.666 + j2 & 3.666 - j11 & -2 + j6 \\ 0 & -1 + j3 & -2 + j6 & 3 - j9 \end{bmatrix}$$

TABLE

Bus	P, pu	Q, pu	V, pu	Remarks
1	–	–	1.04 ∠0°	Slack bus
2	0.5	– 0.2	–	PQ bus
3	1.0	0.5	–	PQ bus
4	0.3	0.1	–	PQ bus

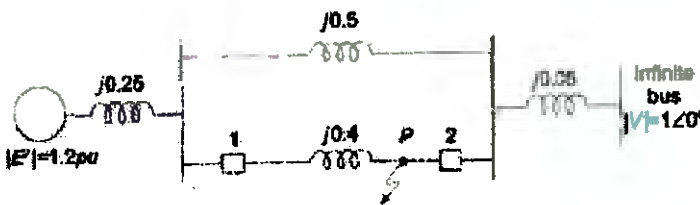|					
5.	Develop the mathematical model of load frequency control system by systematically developing the models of Generator, Load, Prime Mover and Governor.	20	1,2,3,4,5	2,3,4	4
	OR				
	Given the system of Figure given below where a three-phase fault is applied at the point P. Find the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. The reactance				

	values of various components are indicated on the diagram. The generator is delivering 1.0 pu power at the instant preceding the fault.				
6.	a. Critically analyze the scenario on voltage profile of the transmission line when receiving end is open circuited.	10	4,5	2,3	5
	c. Derive static load flow equations explaining clearly each variable used in the derivation.	10	2,3		1,2
7.	a. Critically analyze Voltage-Power Characteristics of radial line with fixed sending end voltage.	10	4,5	2,3,4	5
	b. Solve equations given below by using Eulers Method upto 3 iterations. $$\frac{dy}{dx} = z, y(0) = 5$$ $$\frac{dz}{dx} = \frac{1}{3}\left(e^{-x} - 2z - 5y\right), z(0) = 7$$	10	1,2,3		3

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END SEMESTER EXAMINATION JUNE 2024   12/6/24

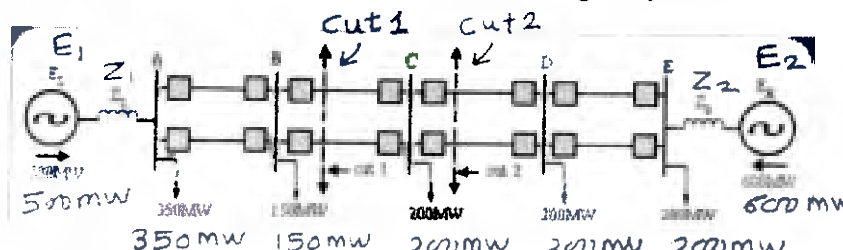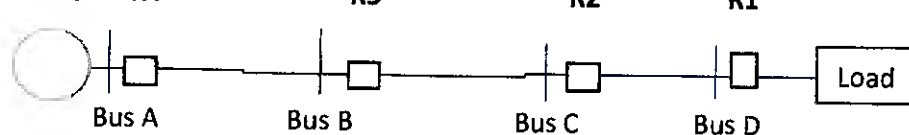| Program:	B. Tech. Electrical	Duration: 3 hours
Course Code:	PC-BTE 602	Maximum Points:100
Course Name: Switchgear & Protection		Semester: VI

Notes: Question 1 is compulsory. Attempt any 4 from remaining 6.

Q. No.	Question	Points	CO	BL	Mo. No.
1a	Suggest suitable protective device from the basket of relays for following various situations. **Justify your answer in brief. There is only one best suitable answer.** [Impedance Relay, Differential Relay, Over-current Relay, Reverse Power Relay, Frequency Relay, Earth Fault Relay, Mho Relay, HRC Fuse, Restricted Earth Fault Relay] 1. Synchronous Generator has lost its prime mover. 2. Stator winding fault occurred in Induction Motor. 3. Line to ground fault on EHV Transmission line 4. 3-phase fault on Bus-bar 5. Line to ground fault in case of a radial distribution feeder.	10	3	5	1,2,3
1b	Explain the overvoltage phenomena with phasor diagram in case a line to ground fault occurs in a 3 phase system with ungrounded neutral. Suggest the remedy. (Only suggest)	10	5	2,3	6
2a	Explain Lightning phenomena in brief. List out the protective devices used against lightning. (only list)	6	3	2,1	6
2b	Explain with neat diagram 3 Zone protection using Mho Relay. Also draw and discuss the contact circuit. Why is zone 1 kept at 80% of the primary line and zone 2 kept at 50% of the next line?	14	1,3	4	2
3a	Draw the typical Architecture (topology) of a Wide Area Measurement System. What are the functions of PMU, PDC and GPS? Why does WAMS perform in a better way than SCADA system?	10	6	2,3	7
3b	Draw and explain functional block diagram of Numerical/Digital Relay	10	6	2,3	1
4a	Explain with the waveform, capacitor bank switching by the circuit breaker. Suggest the solution. (Only suggest)	8	4,6	2,3	4
4b	Compare Air Circuit Breaker (ACB) with Air Blast circuit breaker based on construction (draw the diagrams), working, voltage rating, and applications and limitations.	12	4	4	5

5a	Discuss Type -2 co-ordination used for Induction Motor protection. How is the co-ordination between overcurrent relay and HRC fuse achieved?	10	2,3	2,3	3
5b	Draw and explain with neat diagram differential protection for a Delta-Star (or a Star-Delta) transformer. Show the interconnection of CTs with dot convention.	10	3	2,3	3
6a	Study the given power system carefully. Assume all distance relays are observing a power swing which is resulting in natural separation of the system at cut 2. What will happen to the synchronous generators and overall system if such separation occurs? What is to be done to prevent it and how will you achieve that? Clearly mention which relays to be tripped/not tripped and how? Give all relays proper numbering for your convenience. Note: **Write in brief.**	10	3,6	4,5	2
6b	Suggest a suitable protection to be used in case of loss of excitation of a Synchronous Generator? Support your answer with justification with help of capability curve of generator.	10	3	3	3
7a	An 11 kV, 50 Hz alternator is connected to a system which has inductance and capacitance per phase of 15 mH and 0.02 micro Farad respectively. Determine (i) the maximum voltage across the breaker contacts; (ii) Frequency of transient oscillation; (iii) the average RRRV; and (iv) the maximum RRRV. Suggest a remedy for reducing the RRRV	10	4	3,5	4
7b	Consider the radial feeder as shown below The CT ratio and maximum fault level at each relay is given in the table. Assume maximum load current to be 100 A. Decide the pickup settings and TMS of each relay such that proper relay co-ordination is achieved.	10	1,2,3	3	2

(6a diagram labels) Cut 1 Cut 2 E_1 Z_1 Z_2 E_2 500 mw 350 mw 150 mw 200 mw 200 mw 200mw 600 mw

(7b diagram)

Source R4 R3 R2 R1

Bus A   Bus B   Bus C   Bus D   Load

Relay no.	R1	R2	R3	R4
CT Ratio	200/5	300/5	300/5	400/5
Max. Fault	2000 Amp	3000 Amp	6000 Amp	8000 Amp

Use following IEC standard equation to calculate time of operation.

$$t = TMS * \frac{0.14}{PSM^{0.02} - 1}$$

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End Semester – June 2024 Examinations

T·Y,

| 4/6/24

Program: B. Tech Electrical Duration: 3 Hr

Course Code: PE-BTE602 Maximum Points: 100

Course Name: Control System Design Semester: VI

Note: Q1 is compulsory. Attempt any four questions from the remaining six

Assume suitable data if required

Q. No		Questions	Points	CO	BL	Module No
1	a	Briefly describe the configuration of an observer.	04	3	2	6
	b	Why is the correction factor added to the phase margin required to meet the transient response while designing compensator using Bode plot?	04	2	2	3
	c	Compare design parameters used in time and frequency domain methods.	04	1	2	1
	d	The system transfer function is given by $\frac{Y(s)}{U(s)} = \frac{2s+6}{s^2+5s+6}$ Obtain state space equations for (i) Controllable Canonical form (ii) Observable canonical form (iii) Diagonal form	04	3	3	5
	e	The state space model is given by $x = \begin{bmatrix} 1 & 1 \\ -1 & -2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ and $y = [1 \ 0]x$ Determine the system transfer function and comment about the stability of the system	04	3	3	5
2	a	A unity feedback system with forward transfer function $$G(s) = \frac{K}{s(s + 5)}$$ is operating with closed loop step response that has 15%	10	2	3	2

		overshoot. Evaluate settling time Design compensator to decrease the settling time by three times.				
	b	The unity feedback system with forward transfer function $$G(s) = \frac{K}{(s+1)(s+3)(s+5)}$$ Compensate the system to improve the steady state error of step input response by a factor of 10 if the system is operating with damping ratio 0.4.	10	2	3	2
3	a	Design PID controller (get the values of Kp, Kd, Ki) for unity feedback system with $$G(s) = \frac{K(s+6)}{(s+1)(s+4)(s+8)}$$ so that the system can operate with 20% overshoot and peak time that is two third that of the uncompensated system with zero steady state error.	10	2	3	4
	b	Realize lead-lag compensator and PI, PD, PID controllers using active, passive components. Derive transfer function in each case	10	2	2	3,4
4	a	Write a procedure to design lead compensator using Bode plot. For the unity feedback system, the plant transfer function is given by $$G(s) = \frac{100k}{s(s+36)(s+100)}$$ Design lead compensator using Bode plot to yield	10	2	3	3

		$K_v = 40$ and phase margin 48 degrees				
	b	Design lag compensator using Bode plot for unity feedback system where $G(s) = \dfrac{k(s+4)}{(s+2)(s+6)(s+8)}$ and desired phase margin is 45 degrees with error constant 100	10	2	3	3
5	a	What is controllability? Explain Kalman and Gilbertz tests to check controllability. The system is given by $\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -5 & -6 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$ Check controllability and determine state feedback gain matrix K which places the closed loop poles at $s_1 = -10$, $s_{2,3} = -2 \pm j4$	12	3	3	6
	b	The system $\dot{x} = Ax + Bu$ and $y = Cx$ where $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & -1 & -2 \end{bmatrix}$ $B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ C=[1 0 0] The desired poles are at $s_1 = -10$, $s_{2,3} = -1 \pm j\sqrt{3}$ Find the state feedback controller	08	3	3	6
6	a	Explain various types of system non-linearity and their effect on system performance	05	4	2	7
	h	What id singular point? With an example explain how it is used	05	4	2	7
	c	With an example explain how is the phase plane analysis used to observe the effect of different initial conditions	05	4	2	7
	d	Explain and prove the separation principle for full order observer with controller	05	3	2	6

7	a	Write the analogy between full and reduced order observer.	10	3	3	6
		The system has 4 state variables, , x_0, x_1, x_2, x_3.				
		The state space model for the system is $$\dot{x} = \begin{bmatrix} -2 & 1 & 0 & 0 \\ 1 & -2 & 1 & 0 \\ 0 & 1 & -2 & 1 \\ 0 & 0 & 1 & -1 \end{bmatrix} x + \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix} u$$ $$y = \begin{bmatrix} 0 & 0 & 0 & 1 \end{bmatrix} x$$ Design reduced order observer to estimate states x1, x2, x3. The observer poles are at -4, -5, -6.				
	b	Consider the plant $G(s) = \frac{100}{s(s+4)(s+6)}$ whose state variables are not available. Design an observer to yield transient response described by $\xi=0.4$ and $w_n = 25$. Place the third pole 10 times farther from the imaginary axis than the dominant poles	10	3	3	6

END SEMESTER EXAMINATION JUNE 2024

14/6/24

Program: B. Tech. Electrical Sem VI

Course Code: PE-BTE603

Course Name: Renewable Energy Sources and Grid Integration

Duration: 3 Hrs.

Maximum Points: 100

Semester: VI

Notes:

1. Question number 1 compulsory.
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams.
4. Assume suitable data if necessary.

Q. No.	Questions	Points	CO	BL	Module No.
1.(a)	The hydro-electric power plant consist of following details a. Capacity of hydroelectric power plant= 30 MW b. Elevation difference, h = 300 meter c. Maximum flow rate , Q_{max} = 150 m^3/s d. Minimum flow rate ,Q_{min} = 50m^3/s e. Efficiency of turbine-generator unit = $\eta = 0.7 + 0.001Q$ f. Time period = Sinusoidal rate pattern Calculate : 1. Efficiency 2. Power output at maximum and minimum flow rate 3. How to calculate average power output based on capacity of plant.	10	3	2,3	05
1.(b)	The Central Electricity Authority (CEA) has established specific grid codes for the integration of renewable energy sources with the electricity grid to ensure stability and reliability. Discuss the key requirements outlined by the CEA for renewable energy generators regarding grid connectivity.	10	2,3	2,3	04
2.(a)	With the help of following points describe how a typical hydropower plant generates electricity. 1. Schematic diagram of hydro power plant 2. Role of the dam 3. Role of reservoir 4. Role of penstock 5. Role of turbine and generator.	10	2	2	05

2.(b)	A photo voltaic cell has an open circuit voltage of 0.6V and a short circuit current of 350 A/m² at a cell temperature of 40⁰ C. Calculate the voltage and current density that maximizes the power of the cell. What would be the corresponding maximum power output per unit cell area? What is fill factor of the cell?	10	2,3	2,3	03
3.	Discuss in detail the control strategies used for grid connected residential and industrial solar power plant with the help of following points. 1. Main challenges faced in PV grid integration. 2. Explanation of different control strategies such as Maximum Power Point Tracking (MPPT), voltage control, frequency control and reactive power control. 3. Application of phase locked loop in grid integration	20	5	3,4	07
4.(a)	How to calculate hosting capacity for the transmission and distribution system for connecting distributed renewable energy sources?	10	3	3	07
4.(b)	A 3-phase, 4 pole doubly fed induction generator has rating of 800 KW. The stator is connected to 50 Hz line and rotor winding is connected to variable frequency converter that produces a frequency of 24 Hz from 50 Hz supply. The machine is operating at sub-synchronous speed and wind turbine develops 500 H.P. The wind turbine is connected to the rotor by the way of speed rising gear box. The following information is also given 1. Gear box and other frictional losses (P_f) = 11 KW 2. Rotor copper loss, $P_{cu\,(Rotor)}$ = 3 KW 3. Stator copper loss, $P_{cu\,(Stator)}$ = 10 KW 4. Converter losses, $P_{converter}$ = 2 KW 5. Stator core loss, $P_{i\,(Stator)}$ = 7 KW Find output power and efficiency of wind turbine system?	10	3	3,4	02
5.(a)	With the help of neat diagram Explain the different types of tidal energy systems and their working principles.	10	1	1,2	06
5.(b)	Estimate rating of PV system for your home with the help of following points 1. Home electric load calculation (Calculate total load of your house) 2. Solar panel selection 3. Battery selection 4. Inverter selection 5. Charge controller	10	3,5	3,4	03
6.(a)	Draw the layout of a flash type geothermal power plant and explain the process of how geothermal energy is harnessed and converted into electricity	10	1	1,2	06

END SEMESTER EXAMINATION JUNE 2024

6.(b)	Explain in detail the principles of different renewable energy resources (RES) with emphasis on global and Indian statistics. Include relevant graphs to support your explanation.	10	1	1,2	01
7.(a)	Compare the technologies of solar photovoltaic cells: Amorphous, mono-crystalline and polycrystalline. Provide their V-I characteristics in following conditions. 1. Two similar cells connected in series 2. Two similar cells connected in parallel 3 Two dissimilar cells connected in (a) series and (b) parallel	10	2	1,2	03
7.(b)	Consider a wind turbine with 5m diameter rotor speed of the rotor at 10 m/s, wind velocity is 130 rev./min. and power coefficient at this point is 0.35. Calculate tip speed ratio and torque coefficient of the turbine. What will be the torque available at the rotor shaft? Assume the density of the air to be 1.24 kg/m^3.	05	2	2	02
7.(c)	An application requires 250 W at 24 V. Design a PV panel using solar cells of given parameters: a. Solar cell area : 6 cm^2 b. V_m : 0.542 V c. I_m : 0.1143 A	05	3	2,3	03

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Academic Year 2023 – 24 [Second Half]
End – Semester Examination – June 2024

T. Y.

19/6/24

Program: B. Tech. Electrical Engineering   **Semester:** VI
Course: Open Elective–I [Project Management]   **Date:** 19.06.2024
Course Code: OE–BTE601   **Total Points:** 100

Note: Question No. 1 is compulsory. Answer any **FOUR** questions of the remaining.

CO: Course Outcomes   **BL:** Bloom's Taxonomy Level   **PI:** Performance Indicator

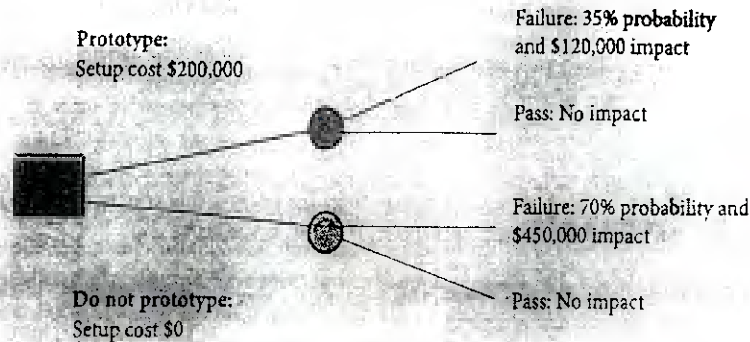| Q. No.	Question	Points	CO	BL
1.	With reference to the case text of *"Caravan App"*, develop a detailed Project Charter for this Project. [The case text is given on Pg No. 4]	20	3	6
2.	**Answer the following questions. All questions carry equal points.**			
	a What is meaning of *corrective action, preventive action* and *defect repair* in relation to monitoring and controlling project work?	05	1	1
	b. Explain the *Tuckman Ladder Model* of *team building*.	05	1	2
	c What is role of PMO in any organization? Explain different types of PMOs.	05	1	1
	d Explain the difference between *quality* and *grade* with an appropriate example. What is *quality management*?	05	1	2
3.	Mr. Rushikesh is appointed as a Project Manager for *Design, Installation & Commissioning of Solar Water Heating System for Bhavan's Andheri Campus.* He is aware that by investing in the overall happiness of his team members, they will experience higher levels of satisfaction which will boost engagement and motivation, and ultimately impact their productivity.	10	2	2
	a Which model for *human motivation* he should refer to understand *what the needs of his team members are and how do they impact their motivation*?			
	b. Explain the different *classification models* Mr. Rushikesh can use for *Analysis of all the Stakeholders* on his project Analysis?	10	2	1
4.	Ms. Asmita is appointed as a Project Manager for *Construction of New Hostel Project at SPCE, Mumbai.*			
	a What should she do to have *positive involvement* of the all *stakeholders* throughout this project?	10	3	1
	b Due to involvement of various stakeholders, a few conflicts may take place during the execution of the project. Which different techniques Ms. Asmita can use to resolve such conflicts? Which are the different *views* she should consider to look at the conflicts, to make those work for the benefit of the project?	10	3	2

a How Decision Tree helps in risk analysis?

Pranav is managing a project of development of a Solar Energy Powered Bicycle. In an effort to determine whether prototyping this product is worthwhile he has come up with the following (see the diagram) impacts of whether this Solar Energy Powered Bicycle works or not. Considering the information provided in this diagram, calculate Expected Monetary Value (EMV) of each option and decide which one is the cheaper option – to prototype or not to prototype.

10 | 3 | 2/3

Prototype:
Setup cost $200,000

Failure: 35% probability and $120,000 impact

Pass: No impact

Failure: 70% probability and $450,000 impact

Do not prototype:
Setup cost $0

Pass: No impact

b Explain following terms, with reference to Quality Management on a project:
(*i*) Gold Plating, (*ii*) Kaizen, (*iii*) JIT
(*iv*) Marginal Analysis (*v*) TQM

10 | 2 | 2

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6. *a* With over 100 locations in 20+ countries, Syncreon is the leading Third Party Logistics (3PL) and Supply Chain Solutions provider; delivering customized end-to-end, best-in-class logistics and supply chain solutions. Syncreon has got a new project to design, build and provide strategic value-added contract logistics from one of its client M/s. Volkswagen Group. Mr. Manav is a Sponsor and Ms. Minham is a Project Manager for this Project. Ms. Minham has figured out following dependencies in this project.

10 | 3 | 3

Activity	Preceding Activity	Estimate in Months
Start		0
D	Start	4
A	Start	6
F	D, A	7
E	D	8
G	F, E	5
B	F	5
H	G	7
C	H	8
End	C, B	0

(i) Help Ms. Minham to draw a Network Diagram and determine duration of the critical path.

(ii) Calculate float for activity B, E and D.

(iii) After some discussion with the Mr. Manav, Ms. Minham realizes that the project duration needs to be shortened by 3 months. To shorten the duration of the project, Mr. Manav has offered to remove the work of Activity E from the project, making activity D the predecessor to activities G and F. Will this option help Minham to shorten the length of the project?

(iv) Which Schedule Compression techniques Ms. Minham can use to shorten the duration of the project? Which activities she can fast track to shorten the project length? ?

	b.	Ms. Gauri has a project to build new fence to a square shaped plot. Each of the four sides of this fence is to take one day to build, and $1000 has been budgeted per side. The sides are planned to be completed one after the other. Today is end of day 3. Using the following project status chart, calculate PV, EV, AC, BAC, CV, CPI, SV, SPI, EAC, ETC, VAC. Also write what does these terms indicate on a project.	10	3	3

Activity	Day 1	Day 2	Day 3	Day 4	Status End Of Day 3
Side 1	S------F				Complete, spent $1,000
Side 2		S------PF	----F		Complete, spent $1,200
Side 3			PS--S---PF		50% done, spent $600
Side 4				PS------PF	Not yet started

Key S = Actual Start, F = Actual Finish, PS = Planned Start, and PF = Planned Finish

7.	a.	What are the advantages and disadvantages of *centralized contracting* and *decentralized contracting*?	10	2	1
	b.	Discuss the place of projects as a vehicle for change-implementing the strategic plans of the organization?	10	2	2

* * * * *

Gayatri and Vrutika were discussing about *"Caravan App"*, a peer to peer car sharing marketplace. Gayatri says, "Vrutika, the main idea of this app revolves around the private car-owners renting out their vehicles through this interface. The car owners will have the freedom to set their own prices for each ride."

While sipping her coffee Vrutika agreed saying, "Car-pooling/car sharing is, by now known car renting model where individuals lease cars for brief time periods. This reduces each person's travel cost, such as fuel cost, toll cost and the stress of driving".

Bhagyashri, who just reached the flat from her office, joined the discussion saying, "the trend of moving a larger part of people's lives online has been supplemented by the development of applications to effectively mimic the real world. Therefore, development of an efficient peer to peer car rental system for the usage of every day individuals and professional rental services will be an appealing extension of this revolution that seeks to make mobility cheap, efficient and easy for everyone connected to the internet."

Romilla, who was listening patiently till now couldn't keep quiet any further and added, "In this age of technology, Caravan will help in reducing air pollution, carbon emissions, traffic congestion on the roads and the need of parking spaces." She further shared, "Due to high initial investment, owing a private car is perceived as luxury by many working professionals. Therefore, making car sharing facilities available will not only help the people to exploit the given service but also help the rentee to generate a side income and thus help in boosting the economy. Also, with more people moving up the social ladder, the need to travel in a private vehicle becomes more of a necessity than a luxury."

"Exactly, that's the reason, CEO of Uber once said; *People have more money to spare than time!*" Urjita exclaimed, joining the discussion.

The *Girls Gang* was now complete and quite excited with the idea. Gayatri asked, "So how to proceed?" Vrutika replied, "Firstly, I think, we should ensure that the app should be compatible with all the platforms like Android, iOS, Windows and even Linux; and of course, this app should enable passengers to book rides to their local destinations and weekend trips as well".

"And I think we should also provide an option to the users to drive the car by self or hire a driver through the app", added Gayatri. "Yes! Good idea! In that case, we would have to allow drivers to register to through the app; we can ask the interested drivers to provide their photo, government identity cards, driving license, medical certificate, character certificate from Police and other required documents at the time of registration," added Bhagyashri.

"And there should be minimum qualification criteria for the drivers, so that they can read and use smart phones properly" Romila continued the discussion further, "Let's jot down following points, (a) the passengers interested to join the ongoing ride, must be able to see the route of the ride, drivers profiles, and other passengers who are sharing a particular ride, (b) passengers should be able to book their journeys in advance, (c) passengers should be able to pay via UPI or other online payment apps like PayTM, etc. alongwith the cash option, (d) we can also think of providing an option of topping up the pre-paid Caravan account to the passengers".

Romila suggested further, "I think Bhagyashri is good at software development, so let her work on software development part of the App; and Urjita can suggest the minimum hardware requirements of the user devices and at the server end!" "Yes, they both are a good team and are the best choice for our technical team!" agreed Gayatri and Vrutika.

"We will need to have broadly 4 to 5 tabs on the main page like, register, browsing, fare calculator, payment and ad-upload and the app design workflow for all the users can be in Unified Modelling Language, (UML)... and it should also consists of the use case diagram, class diagram, sequence diagram, activity diagram, state transition diagram,

dataflow diagrams, etc.", while noting something the note-pad, Bhagyashri whispered, getting engrossed in her thoughts. "Shall we use MySQL database and Java coding for the app?" she asked Urjita.

Urjita replied, "I think yes, that will keep the development cost under control and make our app compatible with even old PCs with 512 MB RAM, with Intel i3 processors running on Windows 7 OS with Xamp server".

Gayatri said, "Girls, you plan further details as early as possible, but make sure that by end of Jan 2023, you complete the pre-sales survey, need assessment, identifications of third party agencies for stakeholder interviews". "And Vrutika, by mid Feb 2023, get the progress reporting formats and any legal compliance required completed", she continued further.

"And see to it that, the identification of risks like the existing competitive apps offering sudden discounts, to make our entry in the market-place difficult, or any resistance from local cabbie drivers, etc. are completed by the end of Feb 2023", Romila suggested to Vrutika. "Also keep in mind that as of now we cannot afford more than Rs. 100,000/- for software/hardware, more than Rs. 200,000/- for any additional manpower requirements", Romila further informed Vrutika.

Vrutika replied, "Yes, that looks sufficient as of now, but we would need minimum Rs. 50,000/- for legal compliances and Rs. 100,000/- for campaigning and advertising". "Okay, then with additional Rs. 50,000/- for contingency, let's finalize the budget of Rs. 500,000/- for this entire effort", suggested Gayatri and continued, "Accordingly, I will approach the Indian Bank for funding us. The loan sanction would not take more than 2 weeks' time." "Okay! Till the time the bank sanctions us the loan, I will fund our efforts from my personal savings", added Romila.

"Yes gals, then we are all set to go!" replied Vrutika.

"Then start the work from tomorrow. I hope you won't mind using your personal laptops initially, and upgrade its configuration as per the need from project funding. Get the initial framework of the app ready maximum by the end of the March 2023 and complete the testing by mid-April 2023", said Gayatri. "Yes. Simultaneously, Bhagyashri, you start the social media campaign for the app from the first week of Jan 2023 and finalize the design of the flyers by the end of the Feb 2023. And Urjita, you please start taking the registration of the car owners aspiring to use this app and drivers to enrol themselves by mid-March 2023 and it should be done by the end of the May 2023", informed Romila.

"I think, simultaneously Bhagyashri and Urjita should also help me in assessing any incidents of data corruption, insufficient analysis of stakeholders, chances hiring of less competent developers, any system design failures, or architecture design issues, or hardware compatibility issues", suggested Vrutika, "and obviously, possible solutions to such issues."

"Yes, you plan it. But Vrutika, keep in mind that unless we are able to show the users, benefits like reduced fuel consumption, reduced travel fatigue and thereby increased productivity, cost saving, the app will not find its major user base", highlighted Gayatri. "Not only that, we'll also need to show the reduced pollution, reduced traffic congestion on roads, to the Traffic Police and Municipal authorities, to win their support and goodwill," added Romila. "And if we can prove the enhanced accessibility and economic opportunities to the low income families, increased convenience, and reduced stress to the users due to shared driving responsibilities, then, we also stand better chances of getting further funding from start-up investors," she continued further.

"OMG, gals, it's almost 11.00 pm. The restaurant nearby will be closing soon. Let's go out and have our dinner first!" Vrutika shouted. "Can we call it as the kick-off party of our project **Caravan -Share My Ride!**" asked Bhagyashri and Urjita.

Credits: This case is based on the Project Charter named "**Caravan -Share My Ride!**" prepared by Ms. Gayatri Devraj, Ms. Vrutika Bavaskar, Ms. Bhagyashri Mahalle, Ms. Romila Basav, Ms. Urjita Mehta, B. Tech. Electrical (2022 Batch)

19/6/24

Program: C/E/M T.Y. B.Tech

Course Code: OE-BTE602

Course Name: Artificial Intelligence

Duration: 3 hours

Maximum Points: 100

Semester: VI

- Attempt any 5 out of 7.
- Make suitable assumptions wherever necessary

Q.No.	Questions	Points	CO	BL
1 a.	Discuss the Wumpus World along with its PEAS description.	10	1	3
1 b.	 i. Calculate the Probability that the person has cancer and X-ray is positive also Dyspnea is true given that the Pollution is low and person is non-smoker. ii. Calculate the Probability that the X-ray is positive.	10	3	3
2 a.	Discuss in detail about the learning agent	10	1	2
2b.	Discuss in brief the history of AI	10	1	2
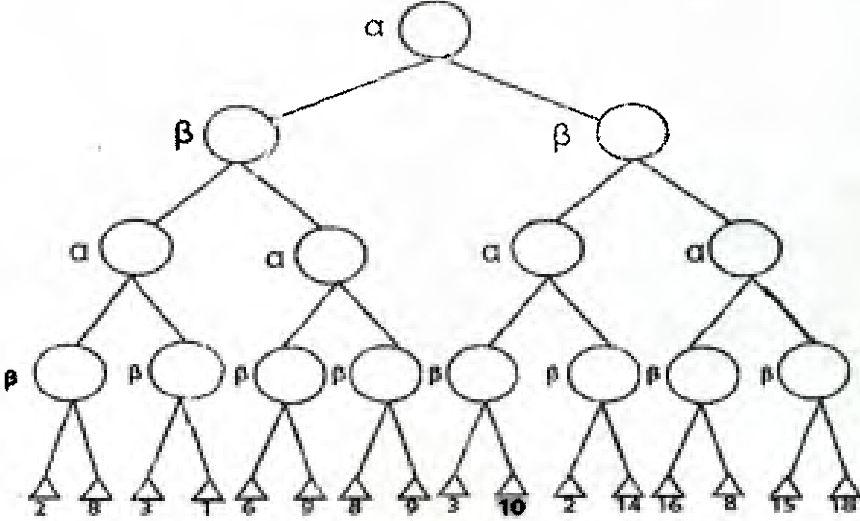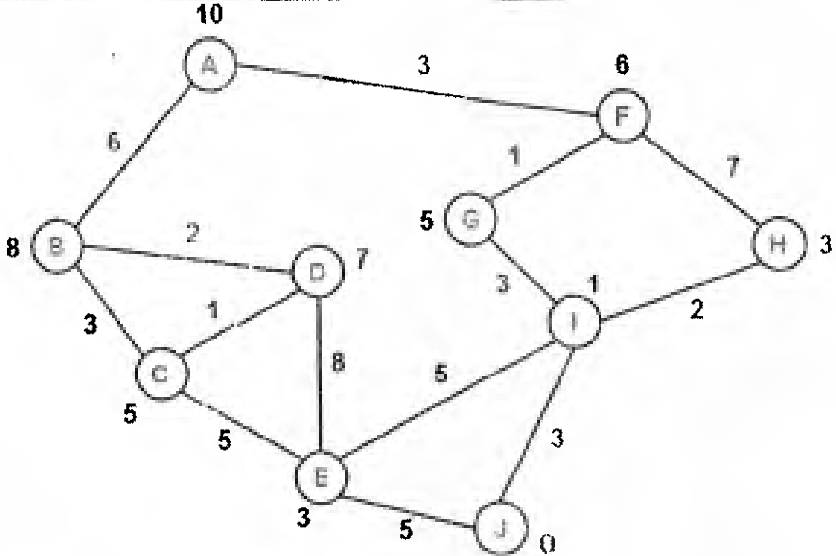
3a.		10	2	3
	To the above gaming tree apply the **alpha beta pruning algorithm** and hence fine the gaming path.			
3b.	We need to travel from node A to node J in minimum cost. Apply A* algorithm to find the least cost path.	10	2	3
4 a.	Explain DLS algorithm. What are its limitations? Explain the new algorithm to overcome the limitations.	10	2	2
4b.	Discuss NLP as an application of Artificial Intelligence	10	3	2

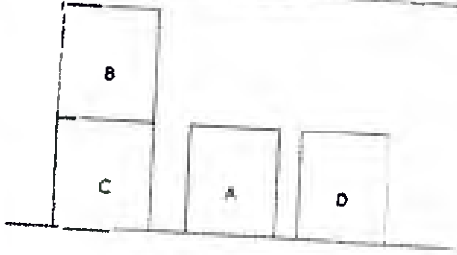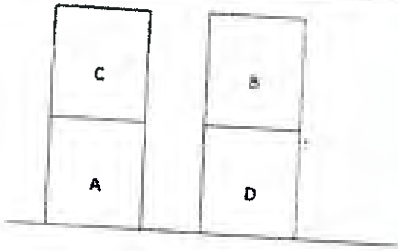|				
5a.	The Law says that it is a crime for an American to sell weapons to hostile nations. The country Nono, and enemy of America, has some missiles, and all of its missiles were sold to it by Colonel West, who is American. **Prove that Colonel West is a Criminal using First Order Logic.**	10	3	3
5b.	Represent the following sentences in FOL 1. All cats are cute. 2. Every man respects his parents. 3. Some students taking AI are genius and hardworking 4. Nobody likes everything 5. Cow likes grass	10	3	2
6a.	Discuss the hill climbing Algorithm. Discuss the limitations of the same.	10	2	2
6b.	Explain the supervised learning with an example.	10	3	2
7a.	Discuss the following rules of inference 1. Modus Ponens 2. Resolution 3. Universal Instantiation 4. Existential Instantiation 5. AND elimination	10	3	2
7b.

Initial State

ON(B,C) ∧ ONTABLE(C) ∧ ONTABLE(A) ∧ ONTABLE(D)
CLEAR(B) ∧ CLEAR(A) ∧ CLEAR(D)

Goal State

ON(C,A) ∧ ON(B,D) ∧ ONTABLE(A) ∧ ONTABLE(D)
∧ CLEAR(C) ∧ CLEAR(B)

For the above Block world senerio develop a STRIPS planning model. Also mention the sequence of the actions which leads to the solution. | 10 | 3 | 3 |

21|6|24.

END SEM EXAMINATION JUNE 2024

Program: T. Y. B. Tech.

Course Code: MC-BTE 003

Course Name: Environmental Science

Duration: 03 Hour

Maximum Points: 100

Semester: VI

Instructions:

1. Attempt any FIVE questions.
2. Draw neat diagrams wherever possible.

Q.No.	Questions	Points	CO	BL	Module No.
Q. 1(a)	What is Environmental Engineering/Science? and explain its importance. State different environmental pollutions and hence discuss control strategies of different environmental problems.	01+02 01+06	01	L-1	01
Q. 1(b)	Discuss the different constitutional provisions for safeguarding the environment by explaining air pollution control act and water pollution control act.	05+ 05	03	L-1	02
Q. 2(a)	What is an ecosystem and ecology? Hence explain structure and functions of an ecosystem.	02+ 04+ 04	01	L-1	03
Q. 2(b)	What is ecological succession? Hence explain primary and secondary succession in detail.	02 +04 +04	01	L-1	03
Q. 3	Explain working principle of following renewable energy sources: 1) Solar Energy 2) Wind Energy 3) Geothermal Energy 4) Tidal Energy 5) Biomass Energy.	20	02	L-1	04
Q. 4(a)	Discuss different causes of mechanical hazards and fire hazards and hence explain various safety measures to be taken to avoid mechanical and fire hazards.	05+ 05	02	L-1	06

Q. 4(b)	Explain hazard analysis objectives and its prevention and safety; hence describe ISO 14000 Standard for environmental management and safety management point of view.	05+ 05	02	L-1	06
Q. 5(a)	Explain an evolution tool 'GRIHA' (Green Rating for Integrated Habitat Assessment) to help design, build, operate and maintain a resource efficient build environment.	10	04	L-1	07
Q. 5(b)	Explain 5 'R' Philosophy for sustainable development of environment and hence discuss GRIHA Assessment criteria to ensure that the construction project reduces its overall environmental impact.	05+ 05	04	L-1	07
Q. 6(a)	What is sustainable energy management? Explain it in detail. Hence, explain different sustainable technologies that help to reduce environmental impact.	05+ 05	01	L-1	05
Q. 6(b)	What are the green commodities? Hence explain the sustainable development in green commodities. What do you understand by carbon credits? Hence, explain the different methods to monitor carbon emission.	05+ 05	01	L-1	05
Q. 7	Write short notes on the following. (a) Carbon Credits.	05+	02		05
	(b) Case study on GRIHA registered building in India.	05+	04	L-1	07
	(c) Ecological succession.	05+	02		03
	(d) Solid waste management.	05	03		01

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester– June 2024 Examinations

24/6/24

T. Y.

Program: B. Tech Electrical

Duration: 3 Hr

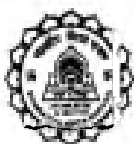Course Code: OE-BTE603

Maximum Points: 100

Course Name: Communication Engineering

Semester: VI

Note: Q1 is compulsory. Solve any four questions from the remaining six questions.

Assume suitable data if required.

Q. No		Questions	Points	CO	BL	Module No
1	a	For data stream 101100101 draw BPSK, DPSK, FSK and ASK modulated waveforms. Consider carrier frequency is twice the data bit frequency	04	1	3	4
	b	How can the performance of pulse code modulation be improved?	04	1	3	3
	c	Show that SSB transmission is power efficient, bandwidth efficient and less susceptible to noise as compared to that of DSBFC AM.	04	1	3	1
	d	Explain how error is detected and corrected for linear block code	04	2	2	6
	e	The men live beyond age 80 to women live beyond age 80 is 3:1. Generate the code which will give code efficiency more than 82%. Calculate code efficiency.	04	2	3	5
2	a	With neat diagram explain FM modulator. An RC capacitive reactance modulator is used to vary the frequency of 10MHz oscillator by ±100KHz. The FET whose trans conductance varies linearly with gate voltage from 0 to 0.628 mS is used in conjunction with a resistance whose value is one tenth of the capacitive reactance used. Calculate an inductance and capacitance of the oscillator tank circuit.	10	1	3	2
	b	What are the advantages of ISB (independent side band) modulation system? How is it implemented?	10	1	3	1

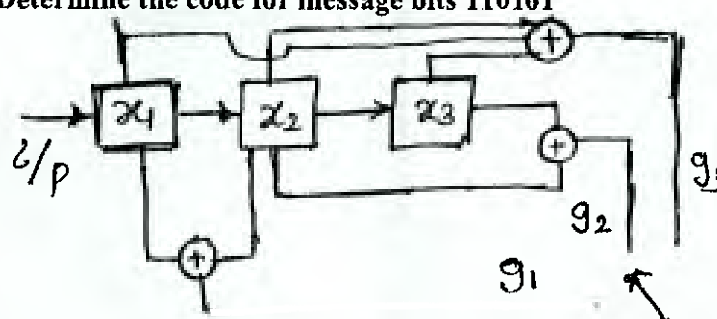|						
		An AM transmitter radiates 1000 KHz of carrier with 50 KW of power. The carrier is modulated with 3 KHz signal. What will be the radiated power if the signal has 80% modulation? Draw frequency spectrum of modulated signal and power content of each spectral component if an antenna resistance is 10 Ω.				
3	a	Compare various digital modulation methods. With a neat block diagram explain BPSK transmitter and receiver	10	1	2	4
	b	In what way delta modulation is better than pulse code modulation? Explain working of delta modulation. What are the possible errors in delta modulation? Explain the method to overcome these errors	10	1	2	4
4	a	Compare various pulse modulation techniques. With neat block diagrams explain pulse position modulator-demodulator.	10	1	2	3
	b	Compare analog and digital communication systems. With a neat block diagram explain digital communication system	10	1	2	3
5	a	Consider the source of information "A" which transmits 4 messages a1, a2, a3, a4 with probabilities 0.5, 0.3, 0.15, 0.05. i. Find entropy ii. Find code efficiency if binary code is used iii. Find code efficiency if Huffman code is used iv. Generate binary tree for the Huffman code generator v. Decode the sequence 0110111100	10	2	3	5
	b	i. What is channel capacity? Explain Shannon Hartely theorem.	10	2	3	5

		ii. A channel has bandwidth 5KHz and S/N ratio is 63. Determine bandwidth needed if S/N ratio is reduced to 31. iii. What is the maximum capacity of noiseless channel where bandwidth is 120 Hz and the data transmitted may be indicated by one of 10 different amplitudes				
6	a	What is a systematic single error correcting (7,4) cyclic code for message m=1010? Determine the data vector transmitted if the received data r= 1010011, For linear (6,3) block code the parity check equations are given by $$p1 = m1 + m2 \qquad p2 = m2 + m3$$ $$p3 = m1 + m3$$ where m_i represents the message. Write generator matrix for systematic linear block code generation and determine the code vector for message 111.	10	2	3	6
	b	Draw the state diagram for the following convolution encoder. Determine the code for message bits 110101	10	2	3	6

$$g_1 = x_1 \oplus x_2$$
$$g_2 = x_2 \oplus x_3$$
$$g_3 = x_1 \oplus x_2 \oplus x_3$$

7	a	Explain the need of multiplexing in communication engineering. Explain in detail time division multiplexing and frequency division multiplexing. Compare the same	10	3	2	7
	b	What is spread spectrum? Explain and compare frequency hopping and direct sequence spread spectrum methods	10	3	2	7

END SEM EXAMINATION JUNE 2024

T. Y.

Program: Electrical Engineering Duration: 3 Hr

Course Code: OE-BTE 604 Maximum Points: 100

Course Name: VLSI Circuit Semester: VI

Instructions:

- Questions one is compulsory.
- Illustrate your answers with neat sketches wherever necessary.
- Figures to the right indicate full marks.
- Assume suitable data if required.
- Preferably, write the answers in sequential order.

Q.No.	Questions	Points	CO	BL	Module No.
1.a	For an n-channel MOS transistor with $\mu n = 76.3\ cm^2V.s$, $C_{ox} = 2.2 \times 10^{-2}\ F/m^2$, W = 20μm, L = 2μm, and, $V_{T0} = 0.48V$. Determine drain current for $V_{gs} = 1.0V$, and $V_{ds} = 0.2V$, 0.4V, 0.6V, 0.8V.	5	1	3	1
b	Write the HDL code to add delays to the function $Y = \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + A\bar{B}C$. It assumes inverters have a delay of 1 ns, 3-input AND gates have a delay of 2 ns, and 3-input OR gates have a delay of 4 ns.	5	4	3	6
c	Consider the given Boolean function $Z = \overline{A(D + E) + BC}$. Draw equivalent gate level circuit, transistor level circuit, stick diagram, and find equivalent $(W/L)_{n,eq}$ and $(W/L)_{p,eq}$ ratio for $(W/L)_p = 18$, $(W/L)_n = 16$.	10	3	3	2
2.a	Consider a CMOS inverter circuit with the following parameters: $V_{DD} = 3.6$ V $V_{T0,n} = 0.6$ V $V_{T0,p} = -0.7$ V $\mu nCox = 65\ \mu A/V2$ (W/L)n = 10 $\mu pCox = 27\ \mu A/V2$ (W/L)p = 19 Calculate the noise margins and the switching threshold of the circuit.	10	2	3	2
b	Given $V_{DD} = 5V$, $k' = 22.0\ \mu A/V^2$, and $V_{T0} = 1V$, design a resistive-load inverter circuit with $V_{OL} = 0.6\ V$. Specifically, determine the W/L ratio of the driver transistor and the value of the load resistor R_L that achieve the required V_{OL}. Consider	10	2	3	2

END SEM EXAMINATION JUNE 2024

	$W/_L$ = 1,2,3,4,5. Also determine V_{IL}, V_{OH}, V_{IH} and Noise margin for $W/_L$ = 2 and respective value of R_L.				
3.a	Sketch the transistor level schematic and layout for CMOS 2-input NAND gate.	5	2	2	3
b	Define: i) Pseudo-nMOS gate, ii) transmission gate. Implement two input multiplexer using CMOS transmission gate.	5	3	3	3
c	Realize the transistor level circuit for given logic equation using Pseudo nMOS gate. $Y = \overline{(A.B + \bar{C}).D}$.	5	3	3	3
d	Describe AOI and OAI gates.	5	3	3	3
4.a	Discuss the operation of three transistors DRAM Cell.	5	2	2	4
b	Give the classification of semiconductor memories. Draw typical random access memory array organization.	5	3	2	4
c	Explain design of column decoder.	5	3	3	4
d	Design a 4-bit X 4-bit NOR based ROM array to store following data stream. Also write its column and rows combination. Data: 1100 1010 0110 1001 Draw layout for circuit designed.	5	3	3	4
5.a	Explain Variable-Threshold CMOS (VTCMOS) Circuits.	5	4	3	5
b	Explain Short-Circuit Power Dissipation.	5	4	2	5
c	Describe switching power dissipation.	5	4	2	5
d	What is clock skew? What are the sources of clock skew? How it can be overcome?	5	4	2	7
6.a	Write HDL behavioral descriptions of a module computing a random Boolean function, $Y = \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + A\bar{B}C$. Each module has three inputs, A, B, and C, and one output, Y.	5	3	3	6
b	Write an HDL module called minority. It receives three inputs, A, B, and C. It produces one output Y that is TRUE if at least two of the inputs are FALSE.	5	3	3	6
c	Write an HDL module that computes a 4-input XOR function. The input is A(3:0) and the output is Y.	5	3	4	6
d	Write an 8:1 multiplexer module called mux8 with inputs S2:0, D0, D1, D2, D3, D4, D5, D6, D7, and output Y.	5	3	4	6
7.a	Explain in detail global clock generator of clock system.	5	4	3	7

b	Comment on the advantages and disadvantages of H-trees and clock grids. How does the hybrid tree/grid improve on a standard grid?	5	4	3	7	
c	Explain Lithography and oxidation along with nMOS fabrication process.	5	1	2	1	
d	Consider a simple abrupt pn-junction, which is reverse-biased with a voltage V_{bias}. The doping density of the n-type region is $N_D = 2 \times 10^{18}$ cm^{-3}, and the doping density of the p-type region is given as $N_A = 4 \times 10^{18}$ cm^{-3} The junction area is A = 10 um x 10 um. Find the equivalent junction capacitance assuming that the reverse bias voltage changes from $V_1 = 0$ to $V_2 = -1$.	5	1	3	1	

Given: $\varepsilon_0 = 8.85 \times 10^{-14}$ F/cm, $\varepsilon_{si} = 11.7 \cdot \varepsilon_0$, q = 1.6×10^{-19}C, k = 1.3×10^{-23} J/K, Intrinsic carrier concentration of silicon (Si) $n_i = 1.45 \times 10^{10}$ (cm^{-3}) at 300K, Thermal voltage kT/q = 0.026 V