POSSESION OF MOBILE IN EXAM IS UFM PRACTICE

Name Smriti Enrollment no 24102178

Jaypee Institute of Information Technology, Noida
Test-1, Examination- 2025
B. Tech, VI Semester

Course Name: Machine Learning for Signal Processing **Max Marks: 20**
Course Code: 18B13EC314 **Max Time:1 Hr.**

CO1	Illustrate various machine learning approaches.
CO2	Experiment with the different techniques for feature extraction and feature selection.
CO3	Apply and analyze various classifier models for typical machine learning applications.
CO4	Make use of deep learning techniques in real life problems.

NOTE: *1. Attempt all questions. Assume the required data.*

Q1 Calculate the spearman rank correlation for the following data

Mathematics	14	15	17	12	16	11	18	9	10
Accountancy	5	13	11	10	2	5	9	4	6

[(CO2), Applying, 5 Marks]

Q2. The two-dimension feature samples are given using the principal component analysis (PCA) convert its in one-dimension feature. [(CO2) Applying, 5 Marks]

Feature	E1		E2	E3	E4
X1	3		4	5	6
X2	7		8	9	10

Q3 State that two variable, qualification and marital state have any relation or not using Chi square test. Data of qualification and marital status is given in table below. Perform the Chi square test using 5% Significant level and tabulate value of Chi square at 5% significant level is 21.03. [(CO2) Applying,5 Marks]

Qualification Marital status	Middle School	High School	Bachelor's	Master	PhD	Total
Never Married	18	36	21	9	6	90
Married	12	36	45	36	21	150
Divorced	6	9	9	3	3	30
Widowed	3	9	9	6	3	30
Total	39	90	84	54	33	300

Q.4 Find the glucose level for age of 55 using linear regression. Glucose level of patient for different age is given in table below [(CO3) Analyzing, 5 Marks]

Patient	1	2	3	4	5	6
Age	43	21	25	42	57	59
Glucose Level	99	65	79	75	89	81

Jaypee Institute of Information Technology, Noida
Test-1 Examination, EVEN2025
B. Tech, VI Semester

Course Title: Control Systems
Course Code: 15B11EC613

Maximum Time: 1 H
Maximum Marks: 20

CO1	Recall the concept of Laplace transform. Define open-loop and closed-loop systems.
CO2	Relate physical systems to transfer function and state-variable models.
CO3	Solve for the time domain response of first-order and second-order systems.
CO4	Analyze the stability of control systems in time and frequency domain.

Note: Attempt all the questions. Assume suitable data, if necessary.

Q1. Determine the transfer function, $\frac{V_2(s)}{V_1(s)}$ for the **Fig. 1**.

[CO1 (Remembering), 2 Marks]

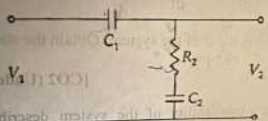

Fig. 1

Q2. For the mechanical system shown in **Fig. 2**, write the system equation and find the transfer function, $\frac{F(s)}{X_2(s)}$ of the system.

[CO2 (Understanding), 4 Marks]

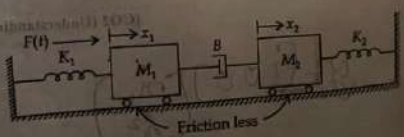

Fig. 2

Q3. Obtain the transfer function, $\frac{C}{R}$ for the block diagram shown in **Fig. 3** using the block reduction technique.

[CO2 (Understanding), 3 Marks]

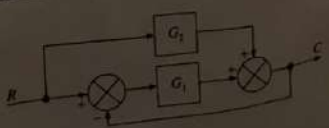

Fig. 3

Q4. Obtain the transfer function, $\frac{x_6}{x_1}$ for the signal flow graph shown in **Fig. 4** using Mason's gain formula.

[CO2 (Understanding), 4 Marks]

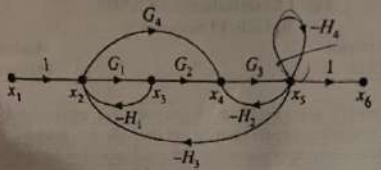

Fig. 4

Q5. A system is described by the following differential equation

$$\frac{d^3y}{dt^3} + 8\frac{d^2y}{dt^2} + 19\frac{dy}{dt} + 10y = 20u(t)$$

where y is the output and u is the input of the system. Obtain the state space representation of the system.

[CO2 (Understanding), 3 Marks]

Q6. Test the controllability and observability of the system described by the following equations.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ -3 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$$[y] = [1 \quad 0] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

[CO2 (Understanding), 4 Marks]

$$y = [1\ 0\ 0] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Enrollment No. 22103178

Jaypee Institute of Information Technology, Noida

T1 Examination, Even 2025
B. Tech, VI Semester

Course Title: VLSI Design
Course Code :18B11EC315

Maximum Time: 1 Hr
Maximum Marks : 20

CO1	Understand VLSI design flow, VLSI design styles, digital systems modeling using Verilog-HDL.
CO2	Apply MOSFET models for circuit simulation and its effect on scaling.
CO3	Analyze the concepts of static and dynamic characteristics of MOS inverters, combinational and sequential circuits.
CO4	Explain and evaluate dynamic logic circuits, stick diagram, layout and different types of semiconductor memories.

Note: *Attempt all the questions. Usage of Calculator is allowed.*

Q.1 Discuss the VLSI design flow and explain various VLSI Design styles in brief.

[CO1 (Understanding), 3+1 Marks]

Q.2 Discuss any three short-channel effects in MOSFETs.

[CO2 (Applying), 3 Marks]

Q.3 Explain different types of scaling methods in MOSFETs and discuss their effects on device characteristics.

[CO2 (Applying), 4 Marks]

Q.4 An NMOS transistor has the following parameters: $V_{T0} = 0.8\,V$, $\gamma = 0.2\,V^{1/2}$, $\lambda = 0.05\,V^{-1}$, $|2\phi_F| = 0.6\,V$, $\mu_n C_{ox} = 20\,\mu A/V^2$.

(a) When the transistor is biased with $V_G = 2.8\,V$, $V_D = 2.8\,V$, $V_S = 1\,V$, $V_B = 0\,V$, the drain current $I_D = 0.24\,mA$. Determine W/L.

(b) Calculate I_D for $V_G = 5\,V$, $V_B = 3\,V$, $V_S = 2\,V$, and $V_B = 0\,V$.

[CO2 (Applying), 5 Marks]

Q.5 Consider an abrupt p-n junction. The doping density of the n-type region is $N_D = 10^{19} cm^{-3}$ and the doping density of the p-type region is $N_A = 10^{16} cm^{-3}$. The junction area is $10\,\mu A \times 10\,\mu A$. Assume that the reverse bias voltage changes from $V_1 = 0\,V$ to $V_2 = -5\,V$. Calculate the equivalent junction capacitance at room temperature. Given $n_i = 1.45 \times 10^{10} cm^{-3}$, $\varepsilon_{si} = 11.7\,\varepsilon_0$, $\varepsilon_0 = 8.85 \times 10^{-14}\,F/cm$.

[CO2 (Applying), 4 Marks]

END OF PAPER

POSSESSION OF MOBILES IN EXAMS IS UFM PRACTICE

Name: Smriti **Enrollment no.:** 22102478

Jaypee Institute of Information Technology, Noida
T-1 Examination, Even 2025
B.Tech. VI Semester

Course Title: Applied Statistical Mechanics **Maximum Time: 1 Hr.**
Course Code: 16B1NPH634 **Maximum Marks: 20**

CO1	Define the fundamental parameters of Thermodynamics and Statistical Mechanics.
CO2	Explain the Thermodynamic potentials, Maxwell's equations and Heat equations.
CO3	Apply the concepts of Thermodynamics and Statistical ensembles to understand the phase space and distribution functions.
CO4	Determine the distribution functions in case of various types of physical and chemical ensembles.
CO5	Evaluate the ideas of Entropy with respect to probability and Information theory; and conclude Liouville's equation.

Attempt all the questions sequentially. Notations used are standard.

1.a) What are the conditions for achieving thermodynamic equilibrium?
b) Which of the following thermodynamic variables are extensive or intensive and why? (i) Pressure (P) and (ii) area (A).
c) What is the difference between the adiabatic work done and non-adiabatic work done?
d) Define internal energy of a system. Is it a state function or a path function?
e) Write down the density of states (ρ) for a microcanonical ensemble.
[CO1 (Remembering), (5 × 1) = 5 Marks]

2.a) What is thermodynamic probability? Is it the same as the normal probability? Explain.
b) How does the entropy of the universe put restriction on the directionality of the natural processes? How is the entropy connected to the ordering of a system?
c) Write down the relation between the Helmholtz free energy (F) and Gibb's free energy (G). What types of thermodynamic variables are these?
[CO2 (Understanding), (3 × 2) = 6 Marks]

3.a) What are the macroscopic parameters which remain constant in canonical ensemble? Write down the partition function for the canonical ensemble.
b) Calculate the work done, when 2 moles of an ideal gas at 25°C expands isothermally and reversibly from 20 litres to 80 litres. Given universal gas constant (R) = 8.31 J K^{-1} mole^{-1}. **[CO2 (Understanding), (2 × 2) = 4 Marks]**

4.a) The partition function $Q_N(V,T)$ of an ideal gas having N molecules is written as: $Q_N(V,T) = \frac{1}{N!}\left[\frac{V}{h^3}(2\pi mkT)^{\frac{3}{2}}\right]^N$; V, h, m, k, T being the volume, Planck's constant, mass of one gas molecule, Boltzmann constant and temperature respectively. Using Stirling's approximation formula, calculate: (i) Helmholtz free energy (F), (ii) Pressure (P).
[CO3 (Applying), (2 × 2½) = 5 Marks]

Jaypee Institute of Information Technology, Noida

(Declared Deemed to be University u/s 3 of UGC Act)
A-10, Sector 62, Noida, 201 307 INDIA

T1 Examination-2025, Even Sem 2025
B. Tech 6th Semester

Course Title: International Trade & Finance | **Time: 1 hr**
Course Code: 19B12HS613 | **Max. Marks: 20**

After pursuing this course, the students will be able to:

CO1	Understand the foundations of international trade and finance in the era of globalization
CO2	Apply the major models and theories of international trade
CO3	Analyze the impact of trade barriers and dynamics on macroeconomic equilibrium
CO4	Evaluate the role of regional blocs and international organizations in economic integration

Note: Attempt all questions.

1. How has globalization influenced the economic growth of developing countries in the last decade? Discuss the benefits and challenges they face in the globalized economy, considering the recent geopolitical events such as trade wars and shifting political alliances.
[CO1 (Understanding), 4 Marks]

2. Greenland has become a global hub for electric vehicle (EV) battery production, driven by key factors that enhances its competitive advantage. The country has abundant reserves of rare earth minerals, a skilled workforce specializing in clean energy, and strong government policies that promote research, innovation and sustainable production. Recently, the government announces a "**Green Energy Acceleration Program**," providing subsidies for battery R&D, tax incentives for manufactures and funding for infrastructure development. A rapidly growing domestic EV market pushes firms to improve battery efficiency, while a well-developed network of supporting industries, including chemical processing and precision engineering, enhances production capabilities. Intense competition among domestic battery producers drives continuous innovation, making Greenland a dominant player in the global EV battery industry.
   i. Which international trade theory can best explain Greenland's success? Discuss.
   ii. Identify the key factors driving Greenland's competitive advantage and group them based on their role in the industry's success.
   iii. Represent these factors in a structured diagram to analyze their interaction.
[CO2 (Applying), 6 Marks]

3. Explain the Heckscher-Ohlin (H-O) theory of trade. How the Factor price equalization theorem is an extension of H-O model?
[CO2 (Applying), 4 Marks]

Two countries, Country X and Country Y, produce two goods: **Computers and Cars**. The labour hours needed to produce one unit of each good are given in the table below:

Country	Computers (hours/unit)	Cars (hours/unit)
X	10	20
Y	40	40

i. Calculate the opportunity cost of producing one car in terms of computers in both countries. Which country has a comparative advantage in producing cars?

ii. If both countries decide to specialize based on the theory of comparative advantage, which good should each country produce? Why? Also suggest a possible trade ratio (terms of trade) that would benefit both countries.

[CO2 (Applying), 4 Marks]

5. Country X exports 500 tons of steel to Country Y in exchange for 150 tons of coal. The price of steel in country X is $400 per ton, and the price of coal in Country Y is $200 per ton. Due to an improvement in steel production technology, the price of steel increases to $450 per ton, while the price of coal remains the same. Calculate Country X's Income Terms of Trade? Also state whether country X capacity to import based on export has increased or decreased as compared to previous year?

[CO2 (Applying), 2 Marks]

Smriti

Jaypee institute of Information Technology, Noida
T-1 Examination, Even Semester-2025
B.Tech ECE 6th Sem/ ACT-4th Sem.

22104R

Course Title: Telecommunication Networks
Course Code:15B11EC611

Maximum Time: 1 Hr
Maximum Marks:20

CO1	To understand the basic concept of Telecommunication network model, Traffic engineering and switching technology. Also to understand various mechanism involved in OSI model, TCP/IP and LAN access protocols, ATM and ISDN	Understanding level (C2)
CO2	To apply the concept of traffic engineering, switching technologies and network protocols for solving network related problems.	Applying level (C3)
CO3	To analyze the link utilization and data packet generated after incorporation of data link error control and flow control mechanisms.	Analyzing Level (C4)
CO4	To apply the concept of subnetting for evaluating address blocks in a network. Applying various algorithms to predict routing path for communication between two nodes.	Evaluating level (C5)

Note: Attempt all questions

Q1. A) Define blocking probability and grade of service for a telecommunication networks, also list down the difference between these two factors. **[CO-1 (understanding)-3M]**

B) A call processor in an exchange requires 60 *ms* of call processing time. If the exchange is capable of carrying 800 E of traffic and each call lasts for an average of 2 minutes, find the following: **[CO-1 (understanding)-4M]**

1. BHCA (busy hour call attempts)
2. CCR (call completion rate)
3. GOS (grade of service)
4. BHCR (busy hour calling rate) if number of subscribers are 1000.

Q2. A) Derive the Lee's blocking probability formula for a N×N, 3-stage space switch, consider 'α' as the inlet occupancy. **[CO1 (understanding)-3 M]**

B) For a 512×512, 3-stage space division switch, the number of 1st and 3rd stage switches are 32 each. If inlet occupancy rate is 0.7, find the blocking probability for following cases **[CO1 (understanding)-3 M]**

1. No. of second stage switches are 16
2. No. of second stage switches are 31
3. Comment on accuracy of the result in part 2

Q3. A 64×32-time division time switch working in random write/ sequential read mode find the following **[CO2- (applying)- 4 M]**

1. No of Address lines and data lines
2. Size of the data memory
3. Size of the control memory
4. Content of the control memory for following inlet-outlet connections

1……20 2……25 3……64 32

Q4. Draw the block diagram of a Time multiplexed time switch with 1 input and output line, also describe its working. **[CO2- (applying)- 3 M]**

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