

Bio-3

S₃(UBE03B01)BE

B.Tech 3rd Semester Mid-Term Examination, 2019
Chemical & Biochemical Thermodynamics
Paper Code: UBE03B01

Full Marks: 50

Time: 2 hours

Question No. 1 is compulsory. Attempt ANY TWO from rest.

- 1(a) Write a short note on internal energy of a system [3 marks]
(b) State second law of thermodynamics in terms of entropy. [2 marks]
(c) Which of the following is not a property of a system: i) pressure, ii) heat, (iii) temperature, (iv) entropy [1 mark]
(d) Consider liquid-vapor equilibrium for 1 mol of water at 1 atm and 0°C. Choose the correct alternative: [2 marks]

- (i) The entropy of water is higher than that of ice.
(ii) The Gibbs free energy of water is higher than that of ice
(iii) Both (i) and (ii) are correct
(iv) Both (i) and (ii) are wrong

(e) Write whether the following statement is true or false: The pH of pure water at 90°C is 7.0. [1 mark]

(f) What is the efficiency for a Carnot's engine operating between 500 K and 300 K? [2 marks]

(g) Explain three main characteristics of a reversible change of state. [4 marks]

(h) Determine the ΔS (in $\text{cal mol}^{-1}\text{K}^{-1}$) for vaporization of water at its normal boiling point. (Given: Latent heat of vaporization of water = 540 cal/g) [3 marks]

(i) What is the difference between close and open system? [2 marks]

2. One mole of helium gas at 300 K and 10 atm expands to 1 atm. Assuming the gas is ideal, calculate (i) heat involved (ii) work involved (iii) change in internal energy (iv) change in enthalpy for (a) reversible and isothermal, (b) irreversible and isothermal, (c) reversible and adiabatic. Give your final answer in the following table format; all values need to be in Joule. Given $C_v = 1.5R$ [15 marks]

	(i)	(ii)	(iii)	(iv)
(a)				
(b)				
(c)				

$du = dw$
 $nC_v dT = nR dT$
 $nC_v dT = -nR dT$
 $C_v dT = -R dT$

3. (a) Compute the change in entropy of the universe when 1 kg of ice at 0°C is added to a large pool of water at 40°C. Latent heat of fusion of ice = 80 cal/g. Specific heat of water = 1 cal/g. [7 marks]

(b) Starting from the definition of G, derive: $\left(\frac{\partial G}{\partial P}\right)_T = V$ and $\left(\frac{\partial G}{\partial T}\right)_P = -S$ (Symbols have their usual meaning.) [8 marks]

0.2597
0.113

293.04

$\frac{nR}{3-1}$

4. (a) Calculate the amount of available energy in kJ/mol from the biological oxidation of alanine ($C_3H_7NO_2$). Given: ΔH (combustion of alanine) = -1577 kJ/mol, ΔH (combustion of urea, CH_4N_2O) = -632 kJ/mol. [10 marks]
- (b) Explain free energy coupling in biological systems [5 marks]

Enrollment No. 18UBEO15

S₃ (UBE03C17)BE

B.Tech 3rd Semester Mid Term Examination, 2019

Fluid Mechanics

UBE03C17

Full Marks: 50

Time: 2 hours

Attempt all questions

- Q1. (a) Write down the general equation of force for SI and English units. 2
- (b) What is the value of g_c in SI and FPS units? 2
- (c) Calculate the force exerted by 5 lb mass in terms of i. lb force ii. Dynes and iii. Newtons. 3
- (d) When an industrial centrifuge is rotated with liquid, then, what will be the shape of the liquid surface? Draw fig. If the values of the radial distance from the axis of rotation to the free liquid surface = 5 cm and radius of bowl = 20 cm, density of the liquid = 1250 kg / m^3 , angular velocity = 50 rad / s , then calculate the pressure drop over the entire ring of the fluid. (1+2+2)
- (e) An manometer is used to measure the pressure drop across an orifice. If the left arm upstream pressure is 5 atm and right arm pressure is 2 atm, density of the liquid = 1260 kg / m^3 and density of the manometer liquid = 13590 kg / m^3 , then calculate the manometer reading. 3
- (f) Define fluid. Give an example of ideal and real fluid? Write down dimensions of absolute and kinematic viscosity. (1+2+2)
- (g) Write the characteristics of potential flow. Give example. (2+1)
- (h) Write down the units of dynamic and kinematic viscosities in CGS and SI units. 2
- Q2. (a) Water at 303°K is flowing at a velocity of 10 m / s in a pipe having an inside diameter of 0.02 m . Calculate the Reynolds no. in SI units. Given: density = 1000 kg / m^3 , viscosity = 0.08 Pa.s . 4
- (b) If a Newtonian fluid is flowing through a straight pipe (length = 1 m , radius = 10 cm), then calculate the shear rate. Given: force applied by the fluid on the pipe wall = 10 N , viscosity = 10 Pa.s . 4
- (c) Two fluids have same densities and kinematic viscosities 10 and $20 \text{ m}^2 / \text{s}$ respectively are flowing through a pipe. If absolute viscosity of one fluid is 10 kg / m.s , then calculate the absolute viscosity of the other fluid. 2
- (d). Draw the profiles of velocity and velocity gradient for fluid flow over a flat plate. 2
- (e) Identify the categories of fluids from the given fluids: Toothpaste, Sewage sludge, Paper pulp in water, milk, sugar in water, blood, paints, sand in water, starch in water, rubber latex, flour, Chocolate. 4
- (f) If an incompressible fluid with a velocity of 0.05 m / s flowing through a straight pipe of diameter 0.02 m at a steady flow condition, then calculate the i. transition length and. ii. Entry length for turbulent flow. 3

(g) If a fluid flows in the x-direction with net velocity 10 m/s with three fluctuating components of velocities 5 m/s , 5 m/s and 5 m/s , then calculate instantaneous total velocity components in x, y and z-directions. 3

(h) If an incompressible Newtonian fluid is flowing through the two parallel plates, then draw the velocity profiles for i. Top plate is moving but bottom plate is fixed. ii. Top plate is fixed but bottom plate is moving. Give the examples of compressible and incompressible fluids. (2+1)

Enrolment No.

S₃ (All): All

B. Tech. 3rd Semester, Mid-Term Examination -2019

Name of Subject: Engineering Mathematics – III / Mathematics – III

Subject Code: UCE03C14/UME03C12/UEE03C13/C16/UCS03B02/C10/UEC03B07/UEI03C13/UPE03C14/UCH03C17/UBE03C15

Full Marks: 50

Time: 2 hours

Symbols used here have their usual meanings

Group-A

Answer the following questions:

25 Marks

- Find the Fourier series of $f(x) = x \sin x$ in $(0, 2\pi)$.
- Expand the function $f(x) = x + x^2$ into Fourier Series in the interval $(-\pi, \pi)$ and hence deduce that

$$\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots$$
- Find the half range sine series for $f(x) = \begin{cases} \frac{1}{4} - x, & 0 < x < \frac{1}{2} \\ x - \frac{3}{4}, & \frac{1}{2} < x < 1 \end{cases}$
- Write down **Dirichlet's conditions** for expansion of $f(x)$ into Fourier series.
 - Solve the partial differential equation: $(x^2 - y^2 - z^2)p + 2xyq = 2xz$.
- Form a partial differential equation by eliminating the arbitrary function ϕ from

$$\phi(x^2 + y^2 + z^2, z^2 - 2xy) = 0.$$

$$[5 + (4 + 2) + 4 + (2 + 4) + 4] = 25$$

Group-B

Answer the following questions:

5 × 5 = 25 Marks

- A manager has two assistants and he bases his decision on information supplied independently by each one of them. The probability that he makes a mistake in his thinking is 0.005. The probability that an assistant gives wrong information is 0.3. Assuming that the mistakes made by the manager are independent of the information given by the assistants, find the probability that he reaches a wrong decision.
- State **Bayes' theorem**.
 - The contents of urns 1, 2 and 3 are as follows:

	No. of white balls	No. of black balls	No. of red balls
Urn 1	1	2	3
Urn 2	2	1	1
Urn 3	4	5	3

One urn is chosen at random and two balls drawn from it. They happen to be white and red. What is the probability that they comes from (i) urn 1, (ii) urn 2 and (iii) urn 3?

P.T.O

3. The following is the probability distribution of a discrete random variable X :

x	0	1	2	3	4	5	6	7	8
$p(x)$	k	$3k$	$5k$	$7k$	$9k$	$11k$	$13k$	$15k$	$17k$

- Find the value of k ,
- Find the distribution function of X ,
- Find the smallest value of x such that $P(X \leq x) > 0.5$

4. In a continuous distribution whose relative frequency density is given by:

$$f(x) = a \cdot x(2 - x), 0 \leq x \leq 2$$

Find the mean, variance, median, mean deviation about mean and mode of the distribution.

5. A multiple choice test consists of 8 questions with 3 answers to each question (of which only one is correct). A student answers each questions by rolling a die and checking the first answer if he gets 1 or 2, the second answer if he gets 3 or 4 and the third answer if he gets 5 or 6. To get a distinction, the student must secure at least 75% correct answer. If there is no negative marking, what is the probability that the student secures a distinction?

$$\frac{3}{4} \times 6 = 4.5$$

$$P(X \geq 6) = 8C6 \times 8C2 \times \frac{1}{6^8}$$

Full Marks: 50

The figures in the margin indicate full marks for the questions
Candidates are required to give their answers in their own words as far as practicable

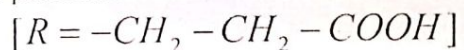
(Group-I & Group-II are compulsory)

Group-I(Q₁ is mandatory and attempt any two questions from the remaining three questions)

1. The kinetics of an enzyme were analyzed in both the absence and presence of **Inhibitor A** and **Inhibitor B**. Given the following data, calculate or construct the following for **A** and **B** on separate graphs.
- Plot the data as a Michaelis-Menten saturation curve. 3
 - Estimate the K_m and V_{max} from these curves both in the presence and absence of inhibitors. 4
 - Plot the data in the Lineweaver-Burk format (*Make sure to label the both the inhibitor line and the no inhibitor line) 3
 - Mathematically determine the K_m and V_{max} . 3
 - What types of inhibitors are A and B? How can you tell? 2

[S](mM)	V(mmol/min)		
	No Inhibitor	A(5mM)	B(0.1mM)
0.2	6	3.6	2.4
0.5	9	6	3.6
0.8	12	9	4.8
1.0	12.84	9.96	4.92
2.0	13.8	12.84	5.76
4.0	16.32	15	6.6

2. Draw the different equilibrium equations of the ionization stages of the amino acid glutamate. Begin with the fully protonated form.

(pK₁=2.2, pK₂=9.7, pK_R=4.3)

- Calculate the pI. 5
- Sketch a complete titration curve for glutamate 4
- What is the charge of this amino acid at pH 9.7? 1

3. Short note on (Any Four)

(a) Edman Degradation, (b) effect of pH and temperature on enzyme activity, (c) Globular & Fibrous Proteins (d) Molten globules (e) Factors that affect stability of an α -helix.

$$\frac{1}{\frac{1}{V_{max}} + \frac{K_m}{V_{max}S}}$$

$$\frac{V_{max}S}{1 + \frac{K_m}{V_{max}S}}$$

$$\frac{1}{\frac{1}{V_{max}} + \frac{K_m}{V_{max}S}}$$

$$0.416$$

$$0.6875$$

$$0.425$$

- | | |
|----------------------------------------------------------------------------|---|
| 4. (a) What do you mean by stereoisomers? Explain with examples? | 2 |
| (b) How many ways are there to represent the stereo isomers of amino acid? | 1 |
| (c) Classification of Proteins on the Basis of Biological Role | 4 |
| (b) write down the steps involved in protein folding | 3 |

Group-II

I. Answer the following question.

3 X 5=15

1. What is a kinase? What role does it play in the cell signaling pathway?
2. Keeping in mind that you are looking at cell signaling mechanisms to understand how cells control growth and division, hypothesize why a mutation in the gene for the Ras protein might lead to cancer.
3. Describe how the part of the receptor on the inside of the cell responds to the binding of chemical signal.
4. Write short notes on (Any 2)
 - a. Action potential of neuronal cell
 - b. Protein alpha helix
 - c. DNA Structure
5. A solution containing 40.00 ppm of B had an absorbance of 0.425 in a 1.00 cm cell at 690 nm. If 5.00 mL of this solution was diluted with water to 100.0 mL, what is the absorbance of the new solution at 690 nm?

II. Answer the following questions. (1 marks each)

5 X 1=5

1. Provide two examples of chemical signals that might start the signaling pathway.
2. Describe what happens when the signal interacts with its cell surface receptor?
3. The cell is exposed to many different chemical signals at any given time. What ensure that the proper signal binds to initiate the desired cell response?
4. What is the function of the Golgi apparatus?
5. Which is a difference between an α -helix and a β -pleated sheet?
6. What is a characteristic of protein quaternary structure?

III. Mark the correct answer only- (0.5 marks each):

0.5 X 10=5

1. The pituitary gland is below the _____.
 - a. pineal gland
 - ☒ b. hypothalamus
 - c. thalamus
 - d. pons
2. Which of the following is not a hormone of the anterior pituitary gland:
 - a. growth hormone
 - b. prolactin
 - c. leutinizing hormone
 - d. oxytoxin
3. Which is not a function of oxytoxin:
 - ☒ a. Cause morning sickness
 - b. helps contract uterus smooth muscle
 - c. secrete milk after birth
 - d. function increases closer to time of birth
4. Which section communicates largely with the hypothalamus:
 - a. anterior
 - b. superior
 - c. posterior
 - d. inferior
5. Which gland is not caused to function by the anterior pituitary gland:
 - a. adrenal
 - b. ovaric
 - c. bladder
 - d. thyroid

6. Binding of a signaling molecule to which type of receptor leads directly to a change in distribution of ions on opposite sides of the membrane?
- receptor tyrosine kinase
 - G protein-coupled receptor
 - phosphorylated receptor tyrosine kinase dimer
 - ligand-gated ion channel
 - intracellular receptor
7. Protein phosphorylation is commonly involved with all of the following except
- regulation of transcription by extracellular signal molecules.
 - enzyme activation.
 - activation of G protein-coupled receptors.
 - activation of receptor tyrosine kinases.
 - activation of protein kinase molecules.
8. The toxin of *Vibrio cholerae* causes profuse diarrhea because it
- modifies a G protein involved in regulating salt and water secretion.
 - decreases the cytosolic concentration of calcium ions, making the cells hypotonic to the intestinal cells.
 - binds with adenylyl cyclase and triggers the formation of cAMP.
 - signals inositol trisphosphate to become a second messenger for the release of calcium.
 - modifies calmodulin and activates a cascade of protein kinases.
9. The receptors for a group of signaling molecules known as growth factors are often
- ligand-gated ion channels.
 - G-protein-linked receptors.
 - cyclic AMP.
 - receptor tyrosine kinases.
 - neurotransmitters.
10. In general, a signal transmitted via phosphorylation of a series of proteins
- brings a conformational change to each protein.
 - requires binding of a hormone to a cytosol receptor.
 - cannot occur in yeasts because they lack protein phosphatases.
 - requires phosphorylase activity.
 - allows target cells to change their shape and therefore their activity.

Enrollment No. 18UBT007

S₃ (UBE03B04) BE

B.Tech 3rd Semester Mid Term Examination, 2019
Human Physiology
Paper Code: UBE03B04

Time: 2 hours

Full Marks: 50

Answer any 10 questions (5 Marks for each):

1. How -70mv resting potential is maintained around the neuron?
2. Make a comparison among skeletal muscle, smooth muscle and cardiac muscle.
3. Draw and describe the schematic representation of blood circulation in whole body.
4. What is peritoneal dialysis and why it is more useful than Hemodialysis?
5. Draw and indicate each part of Nephrons. How ADH hormone helps in reabsorption in tubule.
6. Why small intestine has high level of absorption capacity? Describe with diagram.
7. Draw the typical structure of Motor Neuron and Sensory Neuron. What are the synaptic delay and synaptic fatigue?
8. Write down the developmental process from zygote to a human body.
9. Describe Different types of glands with example in human body.
10. Write down the characteristics of Bone and Cartilage.
11. Write a short note on Erythrocyte, Hemoglobin, Coronary Bypass Surgery, Salivary Glands, and Platelets.

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Enrollment No.

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S₃(UBE03C16)BE

B.Tech 3rd Semester Mid-Term Examination, 2019
Subject Name: Engineering Economics and Accountancy
Subject Code: UBE03C16

Full Marks: 50

Time: 2 hours

The figures in the margin indicate full marks for the questions

Answer all questions.

1. (a) With the help of suitable diagrams explain the relationship between Total Utility (TU) and Marginal Utility (MU).
(b) What are the assumptions and limitations of the cardinal approach of consumer's behavior?
(c) Derive the conditions of consumer's equilibrium under the cardinal approach. Justify your answer with the help of suitable diagrams. (3+3+4=10)

2. (a) With the help of suitable diagrams explain the properties of indifference curve.
(b) Define demand. How it differs from want.
(c) Yesterday, the price of envelopes was Rs.30 a box, and Mr. X was willing to buy 100 boxes. Today, the price has gone up to Rs.35 a box, and Mr. X is now willing to buy 80 boxes. Calculate the price elasticity of demand in this case. (5+2+3=10)

3. Give Journal Entries in the books of S Kumar and also Prepare ledger accounts for Cash, Capital, Furniture, Purchases and Sales Account: (6+4=10)

01/06/2019	S Kumar started business with cash Rs.2, 50,000
02/06/2019	Goods purchased for cash Rs.50, 000
04/06/2019	Furniture Purchased for cash Rs.16, 000
08/06/2019	Goods purchased on credit from R Ltd. Rs.30, 000
10/06/2019	Furniture sold for cash Rs. 10,000
15/06/2019	Goods sold on credit to Mr. H Rs. 55,000
18/06/2019	Interest paid Rs.8, 000
20/06/2019	Cash withdrawn from business for personal use Rs. 2,000
25/06/2019	Commission received Rs.1, 000

4. Define cash book. What are the various types of Cash Book? Prepare a Cash Book of Mr.Goyal from the following cash transactions for the month of July 2019. (3+7=10)

01.07.16	Cash in hand	Rs.80,000
	Cash at Bank	Rs.60,000
03.07.16	Purchased furniture by cheque	Rs.10, 000
08.07.16	Paid salary	Rs.12, 000
11.07.16	Rent Received	Rs. 4,000
18.07.16	Received a cheque from Mr.B	Rs.6, 000
22.07.16	Purchased goods for cash	Rs.10, 000
25.07.16	Received a cheque from Mr. K for	Rs.7, 000
29.07.16	Withdraw cash from bank for private use	Rs.3, 000
31.07.16	Deposited cash into Bank	Rs.8, 000

5. Explain Real Accounts, Nominal Accounts and Personal Accounts with suitable examples. (6)
6. "All transactions are event, but all events are not transaction" discuss with examples. (4)
