THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013 Scheme)

13.301 ENGINEERING MATHEMATICS-II (ABCEFHMNPRSTU)

MODEL QUESTION PAPER

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 4 marks*

1. A particle moves so that its position vector is given by

$\vec{r} = coswt\ \hat{\imath} + sinwt\ \hat{\jmath}$, show that the velocity $\overrightarrow{V}$ of the particle is perpendicular to $\vec{r}$.

2. If $f(x) = x\ ,\ o < x < \frac{\pi}{2}$

$= \pi - x\ ,\ \frac{\pi}{2} < x < \pi$. Show that $f(x) = \frac{4}{\pi}\ (sinx - \frac{sin3x}{3^2} + \frac{sin5x}{5^2} - \cdots)$

3. Find the cosine transform of $f(x) = sinx$ in $0 < x < \pi$.

4. Solve the partial differential equation if $\frac{\partial z}{\partial x} = 6x + 3y\ ; \frac{\partial z}{\partial y} = 3x - 4y$.

5. State the assumptions involved in the derivation of one dimensional Heat equation.

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE-I

6. a) Find the constants a and b so that the surfaces $5x^2 - 2yz - 9x = 0$ and $ax^2y + bz^3 = 4$, may cut orthogonally at the point $(1, -1, 2)$.

b) If φ is a scalar point function, use Stoke's theorem to prove that $Curl(grad\ \varphi) = 0$.

c) Evaluate by Green's theorem in the plane for $\int_C\ (y - sinx)dx + cosx\ dy$ where C is the boundary of the triangle whose vertices are $(0,0), (\frac{\pi}{2}, 0)\ and\ (\frac{\pi}{2}, 1)$.

7. a) If $\vec{r} = x\ \hat{\imath} + y\ \hat{\jmath} + z\ \hat{k}$ prove that $\nabla r^n = nr^{n-2}\ \vec{r}$ where $r = |\vec{r}|$.

b) Show that $\vec{F} = e^x\left[(2y + 3z)\hat{\imath} + 2\hat{\jmath} + 3\hat{k}\right]$ is irrotational and find its scalar potential.

c) Using divergence theorem, evaluate $\iint_S\ F.n\hat{}\ ds$ where $\overrightarrow{F} = 4x\hat{\imath} - 2y^2\hat{\jmath} + z^2\hat{k}$ and S is the surface bounding $x^2 + y^2 = 4, z = 0$ and $z = 3$

MODULE-II

8. a) Obtain the Fourier series of the function $f(x) = \left(\frac{\pi - x}{2}\right)^2$ in $(0,2\pi)$

b) Find the Fourier transform of $f(x) = 1\ , |x| < a$

$= 0\ , |x| \geq a$

Hence evaluate $\int_0^\infty \frac{sinx}{x} dx$

9. a) Find the Fourier series of $f(x) = -x + 1\ , -\pi \leq x \leq 0$

$= x + 1\quad ,\quad 0 \leq x \leq \pi$

b) Find the Fourier cosine transform of $f(x) = e^{-4x}$ and

hence show that $\int_0^\infty \frac{cos2x}{x^2+16} dx = \frac{\pi}{8} e^{-8}$

MODULE-III

10. a) Solve the pde $pxy + pq + qy = yz$.

b) Solve the pde $(D^2 - DD' + 2D'^2)z = e^{3x+4y} + \sin(x - y)$

11. a) Solve the partial differential equation $x(y^2 - z^2)p - y(z^2 + x^2)q = z(x^2 + y^2)$

b) Solve the pde $(D^2 + DD' - 6D'^2)z = ycosx$

MODULE-IV

12. a) Using the method of separation of variables, solve $\frac{\partial u}{\partial x} - 2\frac{\partial u}{\partial t} = u$ given that

$u = 3e^{-5x} + 2e^{-3x}$ when $t = 0$.

b) A string of length l is fixed at both the ends. The midpoint of the string is taken to a height b and then released from rest in that position. Find the displacement of the string.

13. a) Solve $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ subject to the condition, $u(0,t) = 0 = u(\pi,t)$ and

$u(x,0) = \pi x - x^2$ in $(0,\pi)$

b) A rod of length l has its ends A and B kept at 0^0C and 100^0C respectively until steady conditions prevail. The temperature at A is suddenly raised to 25^0C and at the same time that B is lowered to 75^0C and the end temperatures are thereafter maintained. Find the temperature function $U(x,t)$.

THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013Scheme)

13.302 HUMANITIES (BEFMRSU)

MODEL QUESTION PAPER

Time: 3Hours Max. Marks: 100

Instructions**: **Answer Part-I and Part-II in separate Answer Books.

PART-I (Economics)

Time: 2 hrs Max. Marks: 70

PART-A

*Answer **all** questions. Each question carries 2 marks.*

1. Distinguish between Producer good and consumer good.

2. Define production function.

3. Give an example of diminishing returns to scale.

4. Who is an entrepreneur?

5. Define the concept of Marginal Product.

6. What is meant by 'reserve requirement' by banks?

7. Name the methods of measuring National Income.

8. What is stagflation?

9. List out two reasons for Privatisation.

10. Define the concept of Poverty. (2 x10= 20 marks)

PART-B

*Answer any **one** full question from each Module. Each full question carries 25 Marks*

MODULE - I

11. What are the Central problems of an economy? Why do they arise? Do all economies have identical Central Problems?

OR

12. Explain the Law of variable proportion and Law of Returns to Scale.

MODULE - II

13. Explain the different concepts related to National Income calculation. Explain the sectoral distribution of National Income in India and what are the issues associated to it.

OR

14. a) Discuss the impact of multinational companies in Indian Economy.

b) Discuss the impact of globalization on Telecom and Financial sector.

PART-II (Accountancy)

Time: 1 hr Max. Marks: 30

*Answer any **two** questions. Each question carries 15 marks.*

1. Explain the concepts and conventions of accountancy.

2. (a) What are journal accounts? Explain the rules for journalizing.
(b) Briefly explain the accounting package.

3. Based on the following trial balance prepare a profit and loss account and a balance sheet.

The following is the trial balance of Mr. Alex as on 31st December, 2013.

	Dr (Rs)	Cr (Rs)
Plant and machinery	45,000	
Freehold premises	55,000	
Stock 1st January 2006	36,500	
Salaries	7,600	
Purchases	65,000	
Sales		1,21,000
Furniture and fitting	6,000	
Carriage inwards	1,675	
Carriage outwards	1,315	
Sales returns	2,400	
Purchases returns		1,365
Discount received		635
Discount allowed	430	
Wages	16,100	
Sundry debtors	41,000	
Sundry creditors		28,800
Alex's capital		1,10,000
Rent, rates and taxes	1,430	
Advertisement	2,400	
Cash in hand	450	
Cash at bank	2,500	
Drawings	3,000	
Loan from Rajesh		26,000
Total	2,87,800	2,87,800

THIRD SEMESTER B TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: Biotechnology and Biochemical Engineering

13.303 BIOPROCESS CALCULATIONS (B)

MODEL QUESTION PAPER 1

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. Write the general material balance equation and apply the same to a distillation column with recycle of product stream.

2. Wood containing 40% moisture is dried to 5% moisture. What mass of water in kilogram is evaporated per kg of dry wood?

3. The Van der Waals equation of state is given as $\left(P + \frac{a}{V^2}\right)(V - b) = RT$, where a and b are the Van der Waals constants. For CO_2 the constants are found to be a=0.365 N m^4/mol^2 and b=4.28x 10-5 m^3/mol. If the pressure is given in atm and the molar volume in L/mol, what are the values of the constants?

4. Briefly describe the terms limiting reactant and selectivity.

5. Differentiate between proximate and ultimate analysis of coal.

6. How will you theoretically predict the yield coefficients for aerobic fermentation.

7. What is meant by degree of reduction? Determine the degree of reduction for Glucose ($C_6H_{12}O_6$).

8. How is degree of reduction helpful in the determination of heat of combustion?

9. What are the functions of antifoaming agent in media preparation? Name two commonly used antifoaming agents.

10. What are ultracentrifuges? What are the common applications of the same?

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. (a) 100kg of mixed acid composition 40% H_2SO_4, 45% HNO_3 and 15% H_2O is to be produced by strengthening waste acid of composition 30% H_2SO_4, 36% HNO3 and 34% H_20 by weight. Concentrated H_2SO_4 of strength 95% and concentrated nitric acid containing 80% are available for this purpose. How many kilograms of spent acid and concentrated acid are to be mixed together? (14 Marks)

(b) Wood containing 40% moisture is dried to 20% moisture, both moistures expressed on a wet basis. Determine the quantity of water evaporated per kilogram of dry wood.

(6 Marks)

12. (a) Dolomite mainly a mixture of calcium and magnesium carbonates is to be leached with concentrated Sulphuric acid to recover Mg as $MgSO_4$. The rock analysis indicates 20% Ca, 10% Mg and 50% SiO_2. After the reaction the soluble material is filtered off and the solid are washed and discarded. Analysis of the sludge cake shows 50% moisture, 2% SiO_2, 0.5%Mg and 1% Al. What fraction of Mg was extracted?

(6 Marks)

(b) Concentration of CO_2 is measured as o.206 kmol per kmol of MEA (Mono Ethanol Amine- $NH_2CH_2CH_2OH$). Assuming the solution to be nearly 1 kg/l, find the concentration of CO_2 as mass% and mol%.

(6 Marks)

(c) A saturated solution of NaCl is prepared at 373 K is prepared using 100kg of salt. How much water is required? If the solution is cooled to 273^oK, how much salt is precipitated out of the solution? Solubility of NaCl is 39.8 kg/100kg of water at 373^oK and 35.7/100kg of water at 273^oK.

(8 Marks)

MODULE - II

13. (a) Write short notes on proximate analysis, ultimate analysis and Orsat analysis.

(6 Marks)

(b) In the feed preparation section of an ammonia plant, hydrogen is produced by a combination of steam-reforming/partial oxidation process. Enough air is used in partial oxidation to give a 3:1 H_2-N_2 molar ratio in the feed to the Ammonia unit. The H_2-N_2 reaction mixture is heated to reaction temperature and fed to the fixed bed reactor, where 20% conversion of reactants to NH_3 is obtained per pass. The products from the reactor are cooled and NH_3 is removed by condensation. The unreacted H_2-N_2 mixture is recycled and mixed with fresh feed. On the basis of 100 kmole per hour of fresh feed determine the NH_3 production and recycle rate.

(14 Marks)

14. Calculate the theoretical flame temperature of a gas having 20%CO and 80%N_2 when burnt with 150% excess air. Both air and gas being at 25^oC

Given: Mean molar heat capacity for CO_2 is 12.1 cal/mol K.
Mean molar heat capacity for O_2 is 7.9 cal/mol K.
Mean molar heat capacity for N_2 is 7.55 cal/mol K.
Heat of formation of CO_2 at 25^oC is -94,052 cal/mol.
Heat of formation of CO at 25^oC is -26,412 cal/mol

(20 Marks)

MODULE - III

15. (a) Corn-steep liquor contains 2.5% inverted sugars and 50% water; the rest can be considered solids. Beet molasses containing 50% sucrose, 1% invert sugars, 18% water

and the remainder solids, is mixed with corn-steep liquor in a mixing tank. Water is added to produce a diluted sugar mixture containing 2% (w/w) invert sugars. 125 kg corn-steep liquor and 45kg molasses are fed to the reactor.

i. Draw the flow sheet of the same.
ii. How much water is required?
iii. What is the concentration of sucrose in the final mixture?

(12 Marks)

(b) Briefly explain the procedure of determination of stoichiometry of cell growth.

(4 Marks)

(c) Write a note on theoretical oxygen demand for fermentation processes.

(4 Marks)

16. *Sacharomyces cerevisiae* is grown anerobically in continuous culture in a non stirring tank at 30^0C according to the following reaction.

Glucose + $NH_3 \rightarrow$ Biomass + Glycerol + Ethanol +CO_2 +H_2O

Glucose is used as carbon source, ammonia is the nitrogen source. A mixture of glycerol and ethanol is produced. At steady state, mass flow to and from the reactor at steady state are as follows.

Glucose in	36 kg/h
NH_3 in	0.4 kg/h
Cells out	2.81 kg/h
Glycerol out	7.94 kg/h
Ethanol out	11.9 kg/h
CO_2 out	13.6 kg/h
H_2O out	0.15 kg/h

Estimate the cooling requirements by assuming negligible sensible heat change and no evaporation.

Given: MW of glucose 180
MW of NH_3 17
MW of glycerol 92
MW of ethanol 46
Heats of combustion:

$(\Delta h_c^0)_{glucose}$	-2805 kJ/gmol
$(\Delta h_c^0)_{NH_3}$	-382.6 kJ/gmol
$(\Delta h_c^0)_{glycerol}$	-1655.4 kJ/gmol
$(\Delta h_c^0)_{ethanol}$	-1366.8 kJ/gmol
$(\Delta h_c^0)_{cells}$	-21.2 kJ/g

(20 Marks)

MODULE - IV

17. Medium at a flow rate of 2 m^3/h is to be sterilised by heat exchange with steam in a continuous steriliser. The liquid contains bacterial spores at a concentration of $5x10^{12}/m^3$;

the activation energy and Arrhenius constant for thermal destruction of these contaminants are 283 kJ/gmol and 5.7×10^{39}/h respectively. A contamination risk of one organism surviving every 60 days operation is considered acceptable. The steriliser pipe has an inner diameter of 0.1 m; the length of the holding section is 24 m. The density of the medium is 1000 kg/m3 and the viscosity is 3.6 kg/(m h). What sterilising temperature is required?

Given: $D_z/uD = 0.65$; Damkohler no = 42; R=8.3144J/(K gmol)

(20 Marks)

18. (a) Assume that experimental measurements for a certain organism have shown that cells can convert two-thirds (wt/wt) of the substrate carbon (alkane or glucose) to biomass

Calculate the stoichiometric coefficients for the following biological reactions:

Hexadecane: $C_{16}H_{34} + aO_2 + bNH_3 \rightarrow c(C_{4.4}H_{7.3}N_{0.86}O_{1.2}) + dH_2O + e\,CO_2$

Glucose: $C_6H_{12}O_6 + aO_2 + bNH_3 \rightarrow c(C_{4.4}H_{7.3}N_{0.86}O_{1.2}) + dH_2O + e\,CO_2$

(10 Marks)

(b) Calculate the yield coefficients $Y_{X/S}$ (g dw cell/ g substrate), $Y_{X/O2}$ (g dw cell/ g O_2) for both the reactions. Comment on the differences.

(10 Marks)

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THIRD SEMESTER B TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: Biotechnology and Biochemical Engineering

13.303 BIOPROCESS CALCULATIONS (B)

MODEL QUESTION PAPER 2

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. Differentiate between the terms bypass and purging with the help of a schematic diagram.

2. A cellulose solution contains 5% cellulose by weight in water. It is to be diluted to 4% using a 1% solution of cellulose in water. Determine the kilograms of 1% solution required to dilute 100 kg of the 5% solution.

3. It is decided to measure the flow rate of pure air stream by injecting pure CO_2 at a rate of 10mol/h into the flowing stream. The resultant mixture is analysed 8.6% CO_2 on a mole basis. What is the flow rate of the air?

4. Differentiate between yield and selectivity.

5. Define mean heat capacity of gases. How is the mean heat capacity of a gas mixture determined?

6. What is meant by degree of reduction? Determine the degree of reduction for Glucose ($C_6H_{12}O_6$).

7. How will you determine the heat of reaction in aerobic culture?

8. Write the general energy balance equation for cell culture and explain each term.

9. What are filter aids? How are they generally applied?

10. What are the different isolation steps involved in purification of bioproducts? Briefly explain.

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE-I

11. A gas mixture consisting of 65%N_2 and 35% SO_3 by volume is admitted to an absorption column at a rate of 4500 kg/h. It is contacted with a stream of 50% H_2SO_4 flowing counter-current to the gas stream at a rate of 5000 kg/h. The gases leave at 101.3 kPa. Water lost with the exit gases exert a partial pressure of 25 kPa. If the concentrated acid leaving the bottom of the column contained 75% H_2SO_4, what percent of the entering SO_3 is absorbed and converted to acid? (20 Marks)

12. Oil seeds containing 49% oils, 40% pulp, 3% mineral salts and the rest moisture are leached with hexane as the solvent. The underflow from the leaching operation containing 25% hexane, 2.5% salts, 15% oil and 7.5% moisture. The extract contains 25% oil. The extract is distilled to recover the entire hexane in pure form leaving behind the oil, water and salt. The underflow is subjected to steam distillation which recovers 95% hexane. For treating 100 kg seeds, calculate the following:

a) The kilogram of hexane used (10 Marks)

b) The percentage of hexane used that is recovered from the underflow (6 Marks)

c) Percentage recovery of oil (6 Marks)

MODULE - II

13. CO combines with Cl_2 in the presence of a suitable catalyst to form phosgene according to the reaction $CO + Cl_2 \rightarrow COCl_2$. After the reaction, the product contained 12 moles of $COCl_2$, 8 moles of Cl_2, and 8 moles of CO. Assuming the original gas mixture is free of phosgene, calculate the following:

a) Identify the limiting reactant and excess reactant.

b) Percentage of excess reactant used.

c) Percentage conversion of the limiting reactant.

d) The moles of the total product per mol of the reactant mixture fed to the reactor.

e) The volume of the product gas formed under standard conditions.

f) Yield of the reaction.

(20 Marks)

14. Propane is burnt with excess air to ensure complete combustion. If 55 kg of CO_2 and 15 kg of CO are obtained when propane is completely burnt with 500 kg of air, determine the following:

a) The mass of propane burnt (in kg).

b) The percent excess air supplied

c) The composition of the flue gas

(20 Marks)

MODULE - III

15. (a) Corn-steep liquor contains 2.5% inverted sugars and 50% water; the rest can be considered solids. Beet molasses containing 50% sucrose, 1% invert sugars, 18% water and the remainder solids, is mixed with corn-steep liquor in a mixing tank. Water is added to produce a diluted sugar mixture containing 2% (w/w) invert sugars. 125 kg corn-steep liquor and 45kg molasses are fed to the reactor.

i. Draw the flow sheet of the same.

ii. How much water is required?

iii. What is the concentration of sucrose in the final mixture?

(12 Marks)

(b) Briefly explain the procedure of determination of stoichiometry of cell growth.

(4 Marks)

(c) Write a note on theoretical oxygen demand for fermentation processes. (4 Marks)

16. *Sacharomyces cerevisiae* is grown anerobically in continuous culture in a non stirring tank at 30^0C according to the following reaction.

Glucose + NH_3 → Biomass + Glycerol + Ethanol +CO_2 +H_2O

Glucose is used as carbon source, ammonia is the nitrogen source. A mixture of glycerol and ethanol is produced. At steady state, mass flow to and from the reactor at steady state are as follows.

Glucose in	36 kg/h
NH_3 in	0.4 kg/h
Cells out	2.81 kg/h
Glycerol out	7.94 kg/h
Ethanol out	11.9 kg/h
CO_2 out	13.6 kg/h
H_2O out	0.15 kg/h

Estimate the cooling requirements by assuming negligible sensible heat change and no evaporation.

Given: MW of glucose 180
MW of NH_3 17
MW of glycerol 92
MW of ethanol 46
Heats of combustion:

$(\Delta h_c^0)_{glucose}$	-2805 kJ/gmol
$(\Delta h_c^0)_{NH_3}$	-382.6 kJ/gmol
$(\Delta h_c^0)_{glycerol}$	-1655.4 kJ/gmol
$(\Delta h_c^0)_{ethanol}$	-1366.8 kJ/gmol
$(\Delta h_c^0)_{cells}$	-21.2 kJ/g

(20 Marks)

MODULE - IV

17. (a) What are the different methods of sterilisation? Explain how the variation of temperature affects the number of cells during batch sterilization. (10 Marks)

(b) Briefly explain the procedure of determination of stoichiometry of cell growth.

(4 Marks)

(c) Write a note on theoretical oxygen demand for fermentation processes and how it can be determined (6 Marks)

18. (a) How can you improve the rate of filtration? (7 Marks)

(b) A 30 ml sample of broth from a pencillin fermentation is filtered in the laboratory on a 3 cm^2 filter at a pressure drop of 5 psi. The filtration time is 4.5 min. Previous studies have shown tat filter cake of *Pencillin chrysogenum* is significantly compressible with s=0.5. If 500 litres of broth from a fermenter must be filtered in 1 hour, what size filter is required if the pressure drop is (a) 10 psi and (b) 5 psi. Resistance due to the filter is negligible. (13 Marks)

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THIRD SEMESTER B TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: Biotechnology and Biochemical Engineering

13. 304 MICROBIAL BIOCHEMISTRY (B)

MODEL QUESTION PAPER 1

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. What are the "signs of life"?
2. What is a buffer? Discuss the factors determining effectiveness of buffer.
3. Define isomerism. Which are the different types of isomers seen in carbohydrates?
4. What do you mean by saponification?
5. List out the factors affecting base complementarities of polynucleotide chain.
6. What is turnover number?
7. Compare anabolism and catabolism.
8. Discuss the ATP cycle in cells.
9. What is frameshift mutation?
10. Describe the structural components of RNA.

(10x2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. (a) Derive Henderson-Hasselbatch equation. *(10 marks)*

(b) Explain Kiliani synthesis. *(10 marks)*

OR

12. (a) Discuss the chemical bonds involved in protein structure. *(10 marks)*

(b) Explain the chemical properties of lipids. *(10 marks)*

MODULE - II

13. (a) Explain Watson and Crick model of DNA. *(12 marks)*

(b) Discuss the important conclusions of Chargaff's rule. *(8marks)*

OR

14. (a) Discuss the classification of enzymes. *(10 marks)*

(b) Explain the structure of starch. *(10 marks)*

MODULE - III

15. Explain the mechanisms involved in DNA replication. *(20 marks)*

OR

16. (a) What are the factors regulating metabolic pathways. *(10 marks)*

(b) Explain malate-oxaloacetate-aspartate shuttle. *(10 marks)*

MODULE - IV

17. (a) Discuss the role of steroids in metabolic activities. *(10 marks)*

(b) Explain the formation of initiation complex in protein synthesis. *(10 marks)*

OR

18. Briefly explain the stages of β oxidation of saturated fatty acids. *(20 marks)*

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THIRD SEMESTER B TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: Biotechnology and Biochemical Engineering

13. 304 MICROBIAL BIOCHEMISTRY (B)

MODEL QUESTION PAPER 2

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. What is a Bronsted-Lowry acid and Bronsted-Lowry base?
2. Give the general classification of carbohydrates.
3. Explain Ramachandran plot.
4. Discuss the important conclusions of Chargaff's rule.
5. What is an active site? Explain the common features.
6. List out the energy conserving pathways in mammalian cells.
7. What is chemiosmotic coupling?
8. What is ketogenesis?
9. Describe Krebs Bicycle.
10. Discuss the Central Dogma of molecular genetics.

(10x2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. (a) Discuss the reactions involving unsaturated fatty acids. *(10 marks)*

(b) Explain the various weak interactions in aqueous solutions. *(10 marks)*

OR

12. (a) Discuss esterification, etherication and osazone formation by carbohydrates. *(10 marks)*

(b) Explain the types of biological buffer systems. *(10 marks)*

MODULE - II

13. (a) Discuss the important functions of nucleotides. *(8 marks)*

(b) Explain the secondary structure of proteins. *(12marks)*

OR

14. (a) Derive the Lineweaver-Burk equation. *(10 marks)*

(b) Explain non competitive inhibition. *(10 marks)*

MODULE - III

15. Explain the phases of glycolysis. *(20 marks)*

OR

16. Explain the phases of protein synthesis. *(20 marks)*

MODULE - IV

17. Briefly explain the production of urea from ammonia. Also discuss the energetic of urea cycle. *(20 marks)*

OR

18. Explain biosynthesis and utilisation of ketone bodies. *(20 marks)*

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THIRD SEMESTER B TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: Biotechnology and Biochemical Engineering

13.305 MICROBIOLOGY (B)

MODEL QUESTION PAPER 1

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. Differentiate synthetic and crude media.
2. Explain the classification of Archeabactria.
3. Explain the Gaspak system for cultivation of anaerobes.
4. What is synchronous growth? Explain
5. Explain any two physical method of microbial control
6. What is an immune deficiency disorder? Explain.
7. What is limnology? Explain.
8. Explain the structure of an immunoglobulin
9. What are biopesticides? Give examples.
10. Explain Calvin cycle.

(10x2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. (a) Explain the structure and function of bacterial cell wall.

(b) Discuss the various classes of protozoa.

12. (a) Explain the landmark discoveries in the field of microbiology.

(b) Explain about the structure of viruses. What is Lysogenic cycle?

MODULE - II

13. Differentiate SEM from TEM.

14. Explain the various solute transport mechanisms.

MODULE - III

15. Discuss the various microbial community in aquatic systems.

16. Explain the various bacteriological tests used for checking the quality of water.

MODULE - IV

17. (a) Explain about the various antiviral drugs.

(b) Discuss about the various food fermentations.

18. Explain the various pathogenic mechanisms of infectious diseases.

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THIRD SEMESTER B TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: Biotechnology and Biochemical Engineering

13.305 MICROBIOLOGY (B)

MODEL QUESTION PAPER 2

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. What is resolving power of a microscope? Give the equation.
2. Explain microbial Chemotaxis.
3. Explain the contributions of Pasteur.
4. What are Archeabacteria? Give two examples.
5. What are microbial endotoxins?
6. Derive the mathematical expression of exponential growth phase.
7. Distinguish sterilization and disinfection. Give examples.
8. Explain defined substrate test.
9. What are biofertilizers? Give examples.
10. Explain any one antiviral drug.

(10x2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. (a) Explain the structure and function of bacterial flagella.

(b) Explain the newer techniques of microscopy.

12. (a) Explain the landmark discoveries in the field of microbiology.

(b) Explain about the structure of viruses. What is lysogenic cycle.?

MODULE - II

13. Explain the various aerobic pathways operative in the microbial world.

14. Explain the various methods of chemical sterilization process.

MODULE - III

15. Discuss the various interactions seen in microorganism.

16. Explain the various bacteriological tests used for checking the quality of water.

MODULE - IV

17. (a) Explain about the drug resistance seen in bacteria.

(b) about the normal microbial flora of a healthy human host.

18. Explain the various food borne diseases and intoxications.

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THIRD SEMESTER B TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: Biotechnology and Biochemical Engineering

13.306 PRINCIPLES OF MOMENTUM TRANSFER (B)

MODEL QUESTION PAPER 1

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. State Newton's law of viscosity.

2. Discuss about rotational flow &potential flow.

3. Distinguish between skin friction and form friction.

4. Discuss the principle of operation of pitot tube.

5. Give an account of weirs and notches used for flow measurement.

6. Define NPSH.

7. Compare packed bed and fluidised bed.

8. Compare free and hindered setting.

9. Define sphericity.

10. List various gas cleaning methods. *(10x2 Marks = 20 Marks)*

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. (a) What is a centrifugal decanter and develop the relevant equation used for its design.

(10 Marks)

(b) Differentiate Newtonian and non-Newtonian fluids with suitable examples.

(5 Marks)

(c) Considering fluid flow through a circular pipe, derive Hagen-Poiseuille equation.

(5 Marks)

OR

12. Water at $20^{o}C$ is pumped at a constant rate of 9 m^3/h from a large reservoir resting on the floor to the open top of an experimental absorption tower. The point of discharge is 5m

above the floor and the frictional losses in a 50 mm pipe from the reservoir to the tower amount to 2.5 J/kg. At what height in the reservoir must the water level be kept if the pump can develop 0.1kW. *(20 Marks)*

MODULE - II

13. (a) Compare centrifugal and reciprocating pumps. *(5 Marks)*

(b) A centrifugal pumps with an efficiency of 65% is driver by an electric motor with an efficiency of 90%.The pump delivers 250 kg of water against a total head of 25m. What is the horse power required by the motor and what is the power delivered by the motor. *(10 Marks)*

(c) Discuss Laser Doppler anemometry. *(5 Marks)*

OR

14. (a) An Orifice meter with flange taps is to be installed in a 100 mm line to measure the flow of water. The maximum flow rate is expected to be $50m^3/h$ at 15^oc. The manometer used to measure the differential pressure is to be filled with mercury and water is to fill the leads above the surfaces of the mercury. The water temperature will be 15^oC throughout. If the maximum manometer reading is to be 1.25m, what diameter should be specified for the orifice? *(15 Marks)*

(b) With a heat sketch sketch explain the working of a turbine flowmeter *(5 Marks)*

MODULE - III

15. (a) Determine the terminal settling velocity of 100 micron particles settling through a molten slag at 115^0C .The following data is available: Particle density - $4100kg/cm^3$, slag density - $3500kg/cm^3$, slag viscosity - 2.0 poise. State your assumptions & justify it. *(10 Marks)*

(b) Starting from Ergun equation, obtain an equation to find the minimum fluidization velocity. *(6 Marks)*

(c) Define aggregate & particulate fluidization. *(4 Marks)*

OR

16. (a) Water at 24^oC flowing past a long cylinder at a velocity of 1.0m/s in a large tunnel. The axis of the cylinder is perpendicular to the direction of flow. The diameter of the cylinder is 90 mm. Compute the drag force per meter length of the cylinder. Given density of water- 997.2 kg/m^3, viscosity of water - 0.914cp, drag coefficient - 1.40. *(8 Marks)*

(b) Derive expression for power consumption in agitated vessels. *(12 Marks)*

MODULE - IV

17. Discuss the various methods used for subseive particle size analysis. *(20 Marks)*

OR

18. Write short notes on

(a) Size reduction

(b) Capacity and effectiveness of screens

(c) Cyclone Separator

(d) Magnetic Separation

(4 x 5 Marks = 20 Marks)

THIRD SEMESTER B TECH DEGREE EXAMINATION

(2013 Scheme)

Branch: Biotechnology and Biochemical Engineering

13.306 PRINCIPLES OF MOMENTUM TRANSFER (B)

MODEL QUESTION PAPER 1

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. Define ideal & real fluid with suitable example.

2. How is friction factor defined and what is its use?

3. Discuss the principle of hydrostatic equilibrium.

4. What is priming? Why is it necessary?

5. Discuss the working principle of hotwire anemometer.

6. Differentiate between orifice mater and rotameter for flow measurement.

7. Define particulate fluidization.

8. Discuss the significance of power number in an agitated tank.

9. List the different methods used for subseive analysis of particles.

10. Discuss jigging operation. *(10x2 Marks = 20 Marks)*

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. (a) A Newtonian fluid is flowing through a circular pipe under laminar flow conditions. Develop a relation between the local velocity and the maximum velocity. Also sketch the velocity profile. *(10 Marks)*

(b) A centrifugal pump is used to deliver $0.35 m^3/s$ of water through a pipe 30 cm diameter and 80 m long. The water is to be raised to 30 m. the frictional losses in the pipe fittings is 1.5m. Determine the power required if the pump efficiency is 55%. *(10 Marks)*

OR

12. (a) Derive Bernoull's equation with the various correction factors. *(15 Marks)*

(b) Water is flowing through a pipe of 35 cm diameter of 500 m long. The head loss due to friction is 5 m of water. Determine the flow rate of water if the friction factor is 0.004

(5 Marks)

MODULE - II

13. (a) Discuss the following with reference to central fugal pump.

i. Operating characteristics *(7 Marks)*

ii. Cavitation *(4 Marks)*

iii. NPSH *(4 Marks)*

(b) Develop an equation to compute flow rate using Venture meter *(5Marks)*

OR

14. (a) With neat diagram explain the working of a centrifugal pump. *(10 Marks)*

(b) Explain the working principle of a pitot tube. *(5 Marks)*

(c) List any five difference type of values with the function of each. *(5 Marks)*

MODULE - III

15. (a) Air at 311 K is flowing through a packed bed of spheres having a diameter of 12.7 mm. The void fraction of the bed is 0.38, the bed has a diameter of 0.61 m and height of 2.44 m. The air enters the bed at a rate of 0.358 kg/s. Compute the pressure drop of air in the bed. Given density of air = 1.221 kg/m^3, viscosity of air -1.90x10^{-5} Pa.s.

(15 Marks)

(b) Define terminal settling velocity and give the equation used for calculation of the same.

(5 Marks)

OR

16. (a) Air at 37.8^{0}C and 101.3 k Pa absolute pressure flows past a spherical particle having a diameter of 42 mm at a velocity of 23 m/s. Compute the total drag force on the particle. Given density of air – 1.137 kg/m^3, viscosity of air – 1.9x10^{-5}Pa.s. and Drag coefficient is 0.47. *(7 Marks)*

(b) Discuss various dimensionless groups used in the design of agitated vessels. *(6 Marks)*

(c) What are the industrial applications of fluidized beds? Also specify the advantages and disadvantages. . *(7 Marks)*

MODULE - IV

17. (a) Define the various means diameters and sphericity. *(10 Marks)*

(b) Discuss the various methods used to determine particles size distribution. *(10 Marks)*

OR

18. Write short notes on

(a) Photosedimentation

(b) Electrostatic Separation

(c) ICI sedimentation

(d) Bag filter

(4 x 5 Marks = 20 Marks)