Total No. of Questions : **08** Roll No. : 0701.....

B.Tech EIGHTH SEMESTER EXAMINATION JUNE-2025

(Branch : Chemical Engineering)

CM-8301 PROCESS PLANT DEVELOPMENT ECONOMICS

Time : Three Hours ***Maximum Marks : 70***

Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks. Assume suitable data wherever necessary.

1(a) What is a plant design project? Enlist the stages through which it moves to completion.

(b) Justify the various factors to be considered in location of petrochemical complex plant in Madhya Pradesh on sound physico-chemical principles?

2(a) Write a note on flow sheet synthesis and development.

(b) Write in brief on types of flow diagrams. List types of flow diagrams and explain each with a neat sketch.

3(a) Discuss cost indices in chemical engineering cost estimation. Explain how you will use the index method.

(b) Define payout period. How you will estimate the payout period in years with and without interest charge?

4(a) Discuss various practical factors of alternative investment and replacement decision.

(b) Define : (i) Salvage value (ii) Book value (iii) Market Value.

5(a) What is depreciation? Explain giving suitable example.

(b) The original value of a piece of equipment is Rs. 11,00,000 completely installed and ready for use. Its salvage value is estimated to be Rs. 75,000 at the end of a service life. Estimated service life is 10 years. Determine the asset value of the equipment at the end of 5 years using following two methods : (i) Straight line method and (ii) Text book declining balance method.

6(a) Draw a neat diagram and explain break-even point. State importance of break-even analysis.

(b) A proposed chemical plant will require a fixed-capital investment of Rs.10 million. It is estimated that the working capital will amount to 25 percent of the total investment, and annual depreciation costs are estimated to be 10 percent of the fixed-capital investment. If the annual profit will be Rs.3 million, determine the standard percent return on the total investment and the minimum payout period.

7(a) Explain fixed capital and working capital. How capital investment is estimated?

(b) The fixed capital investment for an existing chemical plant is Rs 10,00,000. Annual property taxes amount to 1% of fixed capital investment and the state income taxes are 5% of gross earnings. The net income per year after all taxes is Rs 20,00,000 and the income taxes amount to 34% of gross earnings. If the same plant had been constructed at a location where property taxes were 4% of the fixed capital investment and the state income taxes were 2% of gross earnings, what would be the net income per year after taxes? Assume that all other cost factors were unchanged.

8(a) Define the following : (i) Payback period (ii) Net present worth
(iii) Rate of return on investment.

(b) State any five methods of profitability analysis and explain their principle in detail.

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech EIGHTH SEMESTER EXAMINATION JUNE-2025

(Branch : Chemical Engineering)

CM-8351 (EL-V) PROCESS PIPING DESIGN

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks. Draw neat sketch and assume suitable data wherever you required.

1(a) What is the difference between pipe class and pipe schedule?

(b) Explain the term sizing of a piping system.

2(a) Explain various commonly used piping codes and standards for design.

(b) Can you explain major differences between code ANSI B31.1 and code ANSI B31.3?

3(a) What is the power law model and how does one determine whether a fluid fits this model?

(b) Discuss a point value for the apparent viscosity of non-Newtonian fluid flow through a pipe.

4(a) What is the difference between a time –dependent and time independent inelastic fluid?

(b) Discus the Rabinowitsch-Mooney equation to calculate wall shear rate for a non-Newtonian fluid flow in pipe.

5(a) Discuss the Dean number for flow through curved pipes.

(b) Write recommended design steps for a Bingham fluid transported in a given pipe and we want to know the net driving force (DF) that is required to move a given fluid (μ,ρ) at a specified rate (Q) through a specified pipe (D, L,ε).

6(a) Explain generalized Reynolds number suggested for non-Newtonian fluid by Metzner and Reed $\mathrm{Re}' = \dfrac{\rho u^{2-u'} d_i^{n'}}{8^{n'-1} K'}$.

(b) A general time-independent non-Newtonian liquid of density 961 kg/m^3 flows steadily with an average velocity of 1.523 m/s through a tube 3.048 m long with an inside diameter of 0.0762 m. For these conditions, the pipe flow consistency coefficient Kp' has a value of 1.48 Pa.s$^{0.3}$ [or 1.48 (kg/m.s^2).s$^{0.3}$] and n' a value of 0.3. Calculate the values of the apparent viscosity for pipe flow (μ_a)P, the Reynolds number Re and the pressure drop across the tube, neglecting end effects.

7(a) Define liquid holdup for gas-liquid vertical pipe flow systems.

(b) With the help of neat sketches discuss the slug flow patterns observed in vertical tubes.

8(a) Explain the Baker parameters (B_x and B_y) in two-phase flow regime map.

(b) With the help of neat sketches discuss the stratified flow patterns observed in horizontal tubes.

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech EIGHTH SEMESTER EXAMINATION JUNE-2025

(Branch : Chemical Engineering)

CM-8352 (EL-V) PHARMACEUTICAL TECHNOLOGY

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Discuss advancements in packaging as used in pharmaceutical industry. ***07***

(b) What care is to be taken while establishing stability of packaging materials? ***07***

2(a) Describe with examples the role of governing unit operations in pharmaceutical industry. ***07***

(b) Enlist few pharmaceutical units greatly coming across size reduction, crystallization and humidification. ***07***

3(a) Explain schematic production and formulation of sterile dosage form. ***07***

(b) Mention quality control tests as applied to pharmaceutical products. ***07***

4(a) Submit comparative statements for manufacturing tablets by wet vs dry granulation. ***07***

(b) Chalkout some practical problems while producing tablets on commercial scale. ***07***

5(a) Write precisely about ***any two*** of the following with regard to capsules making – ***7*2***

(i) Hard gelatin capsules
(ii) Soft gelatin capsules
(iii) Quality control tests.

6(a) Analyze the factors to be considered in formulation of facial cosmetics.

(b) Explain the process of formulation of deodorants.

7(a) Discuss the practical problems encountered during formulation of shampoos.

(b) What are functional reasons of observing defects in making tablets?

8 Write in short about ***any two*** of the following with regard to modern pharmaceutical industry – ***7*2***

(i) Unit operations management
(ii) Salient features of quality control tests
(iii) Method of evaluation of packaging materials.

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech EIGHTH SEMESTER EXAMINATION JUNE-2025

(Branch : Chemical Engineering)

CM-8361 (EL-VI) NOVEL SEPARATION TECHNIQUES

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a)	Explain in detail how are separation process categorized.	***07***
(b)	Explain the parameters that governs the separation process.	***07***
2(a)	Mention the benefits and limitation of any one novel separation process.	***07***
(b)	Describe in detail the mechanism of freeze drying.	***07***
3(a)	What do you mean by Membrane process? Explain with suitable example.	***07***
(b)	Discuss the various techniques of membrane preparation.	***07***
4(a)	Give a comparison between ultra filtration and membrane separation.	***07***
(b)	Mention the various membrane modules along with their construction features.	***07***
5(a)	Define the term Osmosis and Osmotic pressure along with suitable example.	***07***
(b)	Explain in detail about concentration polarization. Give its limitation and benefits.	***07***
6(a)	Define the term electro-dialysis and pervaporation along with suitable example.	***07***
(b)	Suggest and explain any one suitable method for the separation of highly mixed components in gaseous mixture.	***07***
7(a)	Give the classification of Ion exchange resin along with their applications.	***07***
(b)	Mention the salient features of ion exchange system.	***07***
8(a)	Define the term Reactive separation and hybrid separation along with their applications.	***07***
(b)	Discuss in detail the environmental issues related to novel separation process.	***07***

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech EIGHTH SEMESTER EXAMINATION JUNE-2025

(Branch : Chemical Engineering)

CM-8362 (EL-VI) FOOD TECHNOLOGY

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Discuss the importance of temperature and surface activity during the processing of food material. ***07***

(b) Discuss the scenario of food processing industry in India. ***07***

2(a) A 20% sucrose solution flows from a mixing tank at 50 KPa through a horizontal pipe 5 cm in diameter and 25 m^2/hr. If the pipe diameter is reduced to 3 cm. Calculate the new pressure in the pipe. Density of sucrose solution is 1070 Kg/m^3. ***07***

(b) Discuss in detail about thermal technologies along with suitable examples. ***07***

3(a) Mention the classification of food preservatives. ***07***

(b) What do you mean by food adulteration, explain in detail with suitable examples? ***07***

4(a) Discuss about the methods to find out the nutritional value of the food along with suitable example. ***07***

(b) Discuss in detail the essential features of fermentation process. ***07***

5(a) Give the limitations and benefits of Sterilization process. ***07***

(b) Describe in detail about any one size reduction equipments used in food industries. ***07***

6(a) Discuss the working principle of rotary dryer along with a neat sketch. ***07***

(b) Give the classification of microorganisms. ***07***

7(a) Discuss in detail the working principle of ultra filtration equipment. ***07***

(b) Mention the applications of super critical fluid technique in food Industry. ***07***

8(a) Discuss the role of packaging material in the storage of food materials. ***07***

(b) Discuss in detail about the environmental issues related to dairy industries. ***07***

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