| Name: |  |  |
| :--- | :--- | :--- |
| Enrolment No: |  | UNIVERSITY WITH A PURPOSE |

## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES <br> Online End Semester Examination, May 2021

## Course: Process Technology \& Economics

B. Tech: CE+RP

Course Code: CHCE 3032

Semester: VI Program
Time: 03 hrs .
Max. Marks: 100

## SECTION A

## 1. All questions are compulsory

2. Each question carries $\mathbf{5}$ marks
3. Assume suitable and necessary data if required and Justify

| Q 1 | The Nitrogenous fertilizer with the highest percentage of nitrogen is <br> a. Calcium Nitrate <br> b. Ammonium Sulphate <br> c. Urea <br> d. Ammonium Nitrate | $\mathbf{5}$ | CO1 |
| :--- | :--- | :---: | :---: |
| Q 2 | The catalyst used in manufacture of sulfuric acid by contact process is <br> a. Vanadium Pentoxide <br> b. Nickel <br> c. Iron <br> d. Platinum | $\mathbf{5}$ | CO1 |
| Q 3 | The operating temperature and pressure in Urea Autoclave is <br> a. $550^{\circ} \mathrm{C}$ and 1000 atm <br> b. $100^{\circ} \mathrm{C}$ and 1000 atm <br> c. $185^{\circ} \mathrm{C}$ and 180 atm <br> d. $25^{\circ} \mathrm{C}$ and 1 atm | $\mathbf{5}$ | $\mathbf{C O 2}$ |
| Q 4 | The feedstock for catalytic reforming unit is <br> a. Kerosene <br> b. Diesel <br> c. Fuel Oil <br> d. Naptha | $\mathbf{5}$ | $\mathbf{C O 2}$ |


| Q 5 | For most chemical plants the ratio of working capital to total capital investment varies from <br> a. $1 \%-5 \%$ <br> b. $50 \%-60 \%$ <br> c. $90 \%-95 \%$ <br> d. $10 \%-20 \%$ |  |  |  |  | 5 | $\mathrm{CO3}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Q 6 | An infinitely lived stream is called <br> a. Perpetuity <br> b. Annuity <br> c. Margin <br> d. Arbitrage |  |  |  |  |  | $\mathrm{CO3}$ |
|  | 1. All questions are compulsory2. Each question carries 10 marks3. Assume suitable and necessary data if required and justify |  |  |  |  |  |  |
| Q 7 | Explain different methods for improving the productivity of a chemical plant |  |  |  |  | 10 | CO1 |
| Q 8 | Describe the manufacturing process of ethylene oxide with neat flow scheme |  |  |  |  | 10 | CO2 |
| Q 9 | A heat exchanger has been designed for use in chemical process. A standard type of heat exchanger with a negligible scrap value costs $\$ 4000$ and will have a useful life of 6 years. Another proposed heat exchanger of equivalent design capacity costs $\$ 6800$ but will have a useful life of 10 years and a scrap value of $\$ 800$. Assuming an effective compound interest rate of $8 \%$ per annum, determine which heat exchanger is cheaper by comparing capitalized costs |  |  |  |  |  | CO3 |
| Q 10 | Estimate by the turnover ratio method, the FCI required for a proposed sulfuric acid plant(batterylimit) which has an annual capacity of $1.3 \times 10^{8} \mathrm{~kg} / \mathrm{yr}$ of 100 percent sulfuric acid (Contact process), using the given data, when the selling price for the sulfuric acid is $\$ 86$ per metric ton. The plant will operate 325 days/year. Repeat the calculation, using the cost capacity exponent method by given data Capital cost data for chemical processing: |  |  |  |  | 10 | CO3 |

Q 11 The manager in charge is considering the purchase and installation of a new pump that will deliver crude oil at a faster rate than the existing one. The purchase and the installation of the new pump will require an immediate layout of $\$ 15,000$. This pump however, will recover the costs by the end of one year. The relevant cash flows is as follows.

|  | 0 | Year |  |
| :--- | :---: | :---: | :---: |
|  | $-15,000$ | 1 | 2 |
| New Pump | 0 | 19,000 | 0 |
| Old Pump | 95,000 | 95,000 |  |

If the oil company requires $10 \%$ minimum annual rate of return on money invested, which alternative should be chosen?

## SECTION C

## 1. Answer any one Question

2. Each Question carries 20 Marks.
3. Assume Suitable and necessary data if required and Justify

Q 12 What does Gross Refinery Margin (GRM) mean? Discuss the factors that determine the profitability of a refinery.

A refinery will require a fixed-capital investment of $\$ 10$ million. It is estimated that the working capital will amount to $25 \%$ of the total investment, and annual depreciation costs are estimated to be $10 \%$ of the fixed-capital investment. If the annual profit will be $\$ 3$ million, determine the standard percent return on the total investment and the minimum payout period

## OR

Explain the outline of accounting procedure for business transactions, and discuss the importance of double-entry book-keeping
Make a balance sheet and also calculate current ratio, cash ratio and debt leverage ratio. Comment on financial position of company.

| Accounts payable: Company X | $125,000,000$ |
| :---: | :---: |
| Accounts payable : Company Y | $75,000,000$ |
| Cash | $70,000,000$ |



