

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: Petrochemical Processes
Program: B.Tech (CE+RP)

Semester: VI
Time: 3hrs
Max. Marks: 100

Instructions: Attempt all questions. Be brief, precise and focused in your answers to be given in order of QN.

SECTION A

| S. No. | | Marks | CO | | | | | | | | | | | | | | | | | | | | | |
|----------------|--|-------------------------|----------------------|---------|---------|------|---------|---------|------|--------------|---------|---------|---------|---------|--------------------------|-------------------------|----------------|-----------------------|---------|--------------|------------------|-----------|---------------------|----------------------|
| Q 1 | Arrange the following list into a table of feeds, operating units, and outturns as given below <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">FEED</th> <th style="text-align: left;">OPERATING UNITS</th> <th style="text-align: left;">OUTTURN</th> </tr> </thead> <tbody> <tr> <td>Benzene</td> <td>Coal</td> <td>Naphtha</td> </tr> <tr> <td>Benzene</td> <td>Coke</td> <td>Olefin Plant</td> </tr> <tr> <td>Benzene</td> <td>Gas Oil</td> <td>Toluene</td> </tr> <tr> <td>Benzene</td> <td>Destructive distillation</td> <td>Solvent extraction unit</td> </tr> <tr> <td>Benzene/xylene</td> <td>Toluene Disproportion</td> <td>Toluene</td> </tr> <tr> <td>Cat reformer</td> <td>Hydro alkylation</td> <td>Reformate</td> </tr> </tbody> </table> | FEED | OPERATING UNITS | OUTTURN | Benzene | Coal | Naphtha | Benzene | Coke | Olefin Plant | Benzene | Gas Oil | Toluene | Benzene | Destructive distillation | Solvent extraction unit | Benzene/xylene | Toluene Disproportion | Toluene | Cat reformer | Hydro alkylation | Reformate | 6X2=12 marks | CO2 & CO4 |
| FEED | OPERATING UNITS | OUTTURN | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | Coal | Naphtha | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | Coke | Olefin Plant | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | Gas Oil | Toluene | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | Destructive distillation | Solvent extraction unit | | | | | | | | | | | | | | | | | | | | | | |
| Benzene/xylene | Toluene Disproportion | Toluene | | | | | | | | | | | | | | | | | | | | | | |
| Cat reformer | Hydro alkylation | Reformate | | | | | | | | | | | | | | | | | | | | | | |
| Q 2 | Calculate: a) How much light naphtha is required to produce one ton of ethylene by steam cracking with normal severity? b) How much propylene approximately would be available from a naphtha cracker producing 0.3 MMTPA of ethylene? c) How much of propylene will be available from a conventional 1MMTPA low/medium severity FCC unit? d) To make at least 500 million pounds of ethylene per annum how much gas oil would have to be cracked in an olefin plant. | 4x2=8 marks | CO1 & CO4 | | | | | | | | | | | | | | | | | | | | | |

SECTION B

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|-----|--|-----------------|------------|
| Q 3 | Explain various fluidization regime and slip velocity in a riser reactor. | 10 marks | CO4 |
| Q 4 | Differentiate between waste heat & CO boiler. Explain giving process examples. | 10 marks | CO4 |
| Q 5 | Differentiate between auto-thermal reforming and partial oxidation of methane to synthesis gas. | 10 marks | CO3 |
| Q 6 | Provide process flow diagram (PFD) ,explaining the process parameter for deep catalytic cracking (DCC) for the maximization of propylene. <p style="text-align: center;">OR</p> Give merits & demerits of linkage / integration between petroleum refinery & | 10 marks | CO4 |

| | | | |
|------------------|---|---------------------|-------------------------|
| | petrochemical complex. | | CO5 |
| SECTION-C | | | |
| Q 7 | As a technical manager of a newly commissioned Indian petrochemical plant, mention in detail why and what kind of technologies you would foresee & propose for the production of Basic/ core petrochemicals for Indian market and their trading globally .List key derivatives of those petrochemicals having more demand and business prospects. Give reasons to justify your proposal so that the country becomes globally competitive quality leader and a low cost petrochemical manufacturing hub | 20 marks | CO1 |
| Q 8 | Describe the configuration of integrated UOP aromatic complex as part of a petrochemical plant. Name various process units, their objectives and importance while explaining the flow scheme especially keeping in mind the cyclic nature of the Petrochemical business. OR Describe the thermodynamics and process technology for dehydrogenation of normal paraffin's, especially that of C3-C4 to maximize corresponding olefins. How oxidative dehydrogenation helps in improving the process? | 20 marks | CO5 CO4 |