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# UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

**End Semester Examination, May 2018**

**Program/course: MBA OG** **Semester – II**
**Subject: FUNDAMENTALS OF REFINING** **Max. Marks : 100**
**Code : OGOG 7005** **Duration : 3 Hrs**
**No. of page/s:3**

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**Please answer all sections. Strictly answer in the chronological order. It's better if explained using diagrams.**

**SECTION A** **(15X2=30Marks)**

**Following are selected statements. Please write / explain / justify with examples/ in 4-5 sentences:**

1.The catalysts used in refinery helps economy of a process.

2. What if in ADU crude is heated to just 250 degree celcious.

3. The Smoke point is important for Diesel / and, or / Kero.

4. Refinery plant layout. (Block diagram)

5. Should a good lubricant have high VI.

6. Are Paraffin's the most important component in MS?

7. The cetane number is important for Diesel / and , or / MS.

8. Opportunity crudes have no limitations and can be used in any refinery.

9. Diesel needs to improve it's Cetane number with some additives.

10. Can waxes be produced in a refinery? Effect of fouling in loss of energy.

11.There is a conceptual difference between 87 and 90 Octane gasoline.

12.The Hydroskimming and a Complex refinery has many differences. Where and how an LOBS would be manufactured?

13. In a refinery plant lay out flares (have specific roles) are placed in a particular section.

14. The approach is: refineries are integrated with petrochemicals for obvious economical reasons.

15. Explain a unit operation, which explains the Hydrocarbon minimization.

**SECTION B (10X4=40Marks)**

16. What is the market structure of refining in India and determine the market structure of motor fuel sales in India using Porters five force Analysis. Explain the basics of Hydrocracker, with feed-stock and products analysis. (5+5)

17. Explain how the low crude oil price over a long period of time affects the refineries GRM and also explain inventory loss for refinery when price of the crude oil drops from $110 to $ 55? Explain the concept of Hydrogen Management in a Refinery. (5+5)

18. Evaluate with the reasoning that still diesel is the preferred fuel in India along with its implications in various sectors of our economy? [Hint: APM]. Diesel hydro-treater is most commonly used in the refineries, explain the process, critically evaluate the new challenges for Euro VI norms for diesel. (5+5)

19. Explain why Natural gas is an important feedstock for petrochemical complex and the processing of natural gas for $C_2$/$C_3$ extraction for petrochemical complex? Explain the process of LPG recovery in a refinery. (5+5)

**SECTION C (10X3=30Marks)**

20. Should the Government of India continue supporting Indian PSU companies or should it privatize the market. Analytically present your comments from the data given below:

| Sales & Profit of petroleum sector (Rs. Crores) | | |
|---|---|---|
| Apr-Dec'2017 | Turnover | PAT |
| Downstream companies (PSU) | 740,367 | 25,983 |
| Standalone refineries (PSU) | 74,494 | 3,862 |
| Private – RIL | 218,108 | 24,915 |

| Borrowings of OMCs (Rs. Crores) | | | |
|---|---|---|---|
| Company | As on March'16 | As on March'17 | Apr-Dec'2017 |
| IOCL | 52,469 | 54,820 | 31,938 |
| BPCL | 15,976 | 23,159 | 15,865 |
| HPCL | 21,337 | 21,250 | 12,124 |
| | | | |
| Petroleum Sector Contribution to Central and State Government | | | |
| Rs. Crores | 2015-16 | 2016-17 | Apr-Dec'2017 |
| | 4,18,652 | 5,24,304 | 3,82,067 |
| Subsidy as a percentage of GDP (at current prices) | | | |
| Particulars | 2014-15 | 2015-16 | 2016-17 |
| Petroleum Subsidy | 0.62 | 0.25 | 0.18 |

21. Imagine there are two crude oil sources one is Heavy, Waxy and Sour Crude (API Gravity 20) and other is Light, Sweet, and low sulphur Crude (API Gravity 35) with price of $ 65 and $70 per

barrels. Assume you as a refiner with 10 MMTPA capacity, what ratio will you mix to get optimum crude basket? Calculate for "Gross Product Worth" of the various petroleum products coming out of your refinery (Assume the current Indian Market Price, 5% loss due to energy and other operational losses ) and show the NRM of your refinery .

22. Case :

*LPG storage vessels : At a refinery in Feyzin, France, butane and propane were stored in eight 1200 cubic metre spherical pressure vessels. Employees cracked open a water draw-off valve to drain water from the bottom of a sphere containing propane. There was an obstruction in the valve, so they opened it fully. The obstruction suddenly cleared, discharging a full stream of propane so that the operators were unable to close the valve. The propane vapour cloud was ignited by a passing car on a motorway 60 m away. About an hour later the leaking sphere BLEVEd. The erupting fireball killed and injured firefighters and hurled a 70- tonnes fragment 300 m. Half an hour later, a second sphere BLEVEd, and three spheres toppled when their unprotected support legs collapsed. 17 people were killed and 84 injured during this incident. ( BLEVE: Boiling liquid expanding vapour explosion)*

*In an another incident , a huge explosion and fire ripped through a Shell refinery in a Western Sydney suburb, killing one person and injuring six others. The blast tore out the side of a boiler, bringing down a 39-tonne catalytic tower. This was followed in 1983 by a major storage tank fire in Milford Haven UK. An 85 m diameter floating roof tank contained more than 250 million barrels of light North Sea crude. The single-skin roof floated at 5 m below its 22 m high maximum. Crude oil seeped through cracks in the floating roof skin (perhaps due to constant flexing in high winds). Ignition was probably caused by incandescent particles released by a nearby flare stack. A boilover occurred. Flames reached 1000 m high and covered 1.5 ha of the 98 m by 196 m dike*

*(Active fire protection : Water supplies, Fire hydrants, Monitor nozzles, Water spray systems, Dry chemical)*

***Fire put out at major PetroChina refinery in Dalian: August 2017,*** *The refinery in Liaoning province and owned by PetroChina Dalian Petrochemical Corp, has three crude distillation units with total processing capacity of 410,000 barrels per day of crude oil. Catalytic crackers typically produce gasoline. More than 600 firefighters extinguished the blaze at the plant's 1.4 million-tonnes-per-annum catalytic cracker The fire came just two months after the Dalian refinery finished a planned major maintenance.*

*[This above is directly relevant to engineers involved in the risk assessment process including:*
*• Design engineers, • Project managers, • Senior managers, • Fire Protection Engineers, • Loss Prevention Engineers, • Health, Safety and Environmental Protection ]*

Above cited three refinery fire incidences. Identify Process Hazard Analysis, as (PHA) is a thorough, orderly, and systematic approach for possible identifying, evaluating, and controlling the fire hazards of processes. The process hazard analysis methodology selected must be appropriate to the complexity of the process and must identify, evaluate, and control the hazards involved in the process. The process hazard analysis shall also to be addressed.