Printed Pages: 02   Sub Code: NAU602

Paper Id: | 900324 | Roll No. | | | | | | | | | | |

B. TECH.
(SEM, VI) THEORY EXAMINATION 2018-19
AUTOMOTIVE FUELS AND LUBRICANTS

Time: 3 Hours   *Total Marks: 100*

Note: 1. Attempt all Sections.
2. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   2 x10 = 20

   a.   What do you understand by the terms thermal cracking and polymerization?
   b.   Mention the functions of lubricant in an engine.
   c.   What do you understand by isomerization?
   d.   What are additives and additive mechanism for lubricants?
   e.   Give the importance of pour point.
   f.   Why short delay period is advisable in CI engines?
   g.   Give the composition of gasohol.
   h.   What is the purpose of antioxidants?
   i.   What are the important properties of an anti-knocking additive to control knock in SI engines?
   j.   What are the various frictional losses in an engine?

SECTION B

2.   **Attempt any *three* of the following:**   10 x 3 = 30

   a.   Explain the chemical structure of petroleum. Give the general formula of the following fuels:

        (i)   Paraffin
        (ii)   Olefin
        (iii)   Naphthene
        (iv)   Aromatic

        Also state their molecular arrangements and mention whether they are saturated or unsaturated.

   b.   Discuss the various properties of automotive fuels. Explain the various engine operating conditions which depend upon the volatility of fuel.

   c.   The volumetric analysis of producer gas supplied to a gas engine is H_2 = 20%, CH4 = 3%, CO=22%, CO_2=8% and N_2=47%.
        (i)   estimate the column of air required for complete combustion of 1 m^3. of gas.
        (ii)   if 50% excess air is added, find the percentage contraction in volume after the products of combustion have been cooled.
   d.   Which are the alternative fuels for I.C. Engine? Write a short note on some of them.

   e.   Discuss in detail the effect of engine variables on friction and the methods to minimize the same.

SECTION C

3.   **Attempt any one part of the following:**   **10 x 1= 10**

    (a)   List the important products of refining process. Also write the boiling range and uses of these Products.

    (b)   Explain the stages of manufacturing of lubricating oil in detail.

4.   **Attempt any one part of the following:**   **10 x 1 = 10**

    (a)   Describe with neat sketch the following calorimeters used for determination of heating values.
        (i)   Bomb calorimeter
        (ii)   Junkers gas calorimeter

    (b)   An internal combustion engine is supplied with a mixture of octane vapor (C_8H_{18}) and air. Under steady running conditions the dry exhaust gas analysis shows 13% CO. Assuming combustion to be complete, determine the ratio by volume of fuel to air supplied, and express this as a percentage of the chemically correct ratio.

5.   **Attempt any one part of the following:**   **10 x 1 = 10**

    (a)   Explain the term knocking in C. I. engine. How it is different from knocking in S. I. engine?

    (b)   Petrol for SI engine contains 84% carbon and 16% hydrogen. The fuel air ratio is 1:14. Assume all hydrogen is burnt, no burnt carbon residue remains and there is no free oxygen in the products of combustion. Calculate:
        (i)   the mass of carbon burning to CO_2.
        (ii)   the mass of carbon burning to CO.
        (iii)   the mass of individual constituents gases in the products combustion.

6.   **Attempt any one part of the following:**   **10 x 1 = 10**

    (a)   Explain the construction and working principle of hybrid vehicle with neat sketch.

    (b)   Explain the meaning of ignition advance. What are the factors, which affect its variation?

7.   **Attempt any one part of the following:**   **10 x 1 = 10**

    (a)   (i) Explain the requirements for automotive lubricants.
        (ii) Explain in detail about synthetic lubricants.

    (b)   Clearly explain the various wet sump lubrication system. Compare the wet sump and dry sump lubrication system.