

Centre for Energy Studies
Indian Institute of Technology Delhi

ESL875 Alternative Fuels for Transportation

Major Exam

Part B

Marks: 25 (50 points)

27.11.2008

Name :

Ent.No:

Note: Answers should be given in Question paper itself except for Questions of 14 to 18

Please tick on true or false for questions from 1 to 5

1 X 5 = 5 points

1. Stearic acid methyl ester has higher Cetane number than normal diesel : True / False
2. High olefins in SI engine would lead high emissions : True / False
3. Cloud point is always higher than pour point : True / False
4. Removal of unsaturation in biodiesel may worsen the cold flow properties: True / False
5. Cetane number would increase with increase in aniline point: True / False

Fill in the blanks for questions from 6 to 10

1 X 5 = 5 points

6. Free Fatty acid of Jatropha oil is in the range of
7. Future requirement of sulfur in diesel and gasoline fuel are about and
8. NO_x emission from engines is a strong function of fuel quality of
9. Typical gum number of Biodiesel and diesel are aboutand
10. Aromatic & olefin content of future gasoline should be

11. Write the thermo-chemical characteristics of olefins in petroleum fuels? (2)

12. If Cetane number, density, sulfur, T₉₀, olefin of a diesel fuel are 55, 0.85g/ml, 0.1%, 350° C and 20% respectively. Calculate the particulate matter (g/kW-hr) using the properties. Assume the correlation constants a, b, c, d are -7.9778, -0.010373, 10.6487, 3.83949, and 0.001616 respectively (3)

13 Explain briefly for questions from i to iv:

i) Explain about importance of enhancement of ethanol production for successful implementation of Biodiesel program for our country using the ethanol requirement relationship with biodiesel. (2)

ii) Write the reasons of ethanol blended gasoline is not successful even 5% for entire country whereas other countries such as Brazil have successes for high blend of E85. (1)

iii) Why B20 & E15 is more preferable than neat B100 or E100? (2)

iv) India needs about 110 MMT crude oil per annum and in future, it may rise about 3 to 4 times than today's requirement. How can alternative fuel play a vital role to fill some demands of auto fuel quantitatively? (1)

14. List possible methods for complete conversion of jatropha's tree product such as kernel, seed etc. into useful fuels with quantitative figure? (3)

15. Explain the transesterification process of Biodiesel from non-edible oil for two cases of high and Low FFA. Also explain the problems of existing biodiesel production technologies and key quality issues for production of high quality ester for meeting ASTM standards. (8)

16. Why Fisher-Tropsch diesel is more preferable than petroleum derived diesel. Explain briefly the production process of F-T diesel from coal with suitable catalyst. (6)

17. Why Butanol is more preferable than ethanol and methanol?. You compare the Butanol with other alcohol fuels and base gasoline in terms of physico-chemical properties, engine performance and emissions qualitatively in a tabular form. (7)

18. Explain about bi-fuel operation or flexible vehicles?. If use of CNG in a dedicated gasoline fuelled vehicles, what are technical issues in terms of fuel quality and engine performance? What factors needs to be considered for future vehicles in order to get same or superior performance than gasoline. You give your comments with detailed comparisons of neat gasoline operation with frequent switch over to CNG/gasoline. (5)