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**MMTP-102****M.E./M.Tech., I Semester**

Examination, June 2017

**Thermodynamics and Combustion****Time : Three Hours****Maximum Marks : 70**

**Note:** i) Attempt any five questions.  
ii) All questions carry equal marks.

1. a) Define classical thermodynamics and its parts.  
b) Explain Availability for open system and its analysis in thermal system.
2. Explain equilibrium composition of different components of gaseous mixtures with suitable reactions.

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3. Two vessels, A and B, both containing nitrogen, are connected by a valve which is opened to allow the contents to mix and achieve an equilibrium temperature of 27°C. Before mixing the following information is known about the gasses in the two vessels.

Vessel A  
p = 1.5 MPa  
t = 50°C

Vessel B  
p = 0.6 MPa  
t = 20°C

Contents = 0.5 kg mol      Contents = 2.5 kg

Calculate the final equilibrium pressure and the amount of heat transferred to the Surrounding. If the vessel had been perfectly insulated. Calculate the final temperature and pressure which would have been reached. Take  $\gamma = 1.4$ .

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4. a) Define the following:  
i) Triple point      www.rgpvonline.com  
ii) Critical point  
iii) Vander walls equation of state  
b) Explain laminar and turbulent flames.
5. a) Discuss types of combustion process.  
b) Explain in detail pre-mixed and diffusion flames with properties and structures.
6. What is equation of state? Discuss various phases of gases. Explain the use second and higher order reactions.
7. a) Discuss theories of flame propagation.  
b) Differentiate combustion of solid, liquid and gaseous fuels.
8. Explain Zeroth law of thermodynamics. State the Kelvin plank statement of second law of thermodynamics. Discuss difference between heat pump and refrigerator.

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