

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination (Online), July 2020

Course: Rocket Propulsion

Program: B.Tech (ASE)

Course Code: ASEG 425

Instructions: All questions are compulsory. Assume data if missing.

Semester: VIII

Time 03 hrs.

Max. Marks: 100

SECTION A

S. No.	Each question in the Section A is a multiple-choice question with four answer choices. Read each question and answer choice carefully and choose the ONE best answer. Try to answer all questions	Marks [03x10=30]	CO
Q 1	Which of the following will happen if there is a flow obstruction in the nozzle inner wall? a) Local conversion of kinetic to thermal energy b) Local drop in pressure around the region of obstruction c) Formation of normal shock waves at the point of obstruction d) Rapid decrease in mass flow rate	03	CO3
Q 2	Which of the following will improve the performance of a rocket engine? a) Decrease in gas temperature b) Increase in the molecular mass of the propellant c) Decrease in the pressure ratio d) Increase in the chamber pressure	03	CO2
Q 3	Energy release efficiency is also called as _____ a) isentropic efficiency b) polytropic efficiency c) propulsive efficiency d) combustion efficiency	03	CO1
Q 4	How are liquid rocket engines classified on the basis of their feed system? a) Pressurized or turbopump b) Restartable or single fired c) Single flight or reusable d) Boosting or auxiliary	03	CO1
Q 5	Determine the mixture ratio if mass flow rate of the oxidizer is 3/4 times the total mass flow rate of the combustion products. a) 2.5 b) 3	03	CO2

	c) 2 d) 1		
Q 6	_____ system determines the maneuver to be performed and _____ system sends command signals to specific thrusters for number of signals required. a) Control; control b) Guidance; guidance c) Control; guidance d) Guidance; control	03	CO1
Q 7	Which of the following is a monopropellant? a) H ₂ b) Diluted H ₂ O ₂ c) Hydrazine d) Monomethyl hydrazine	03	CO3
Q 8	How does the total thrust vary with an extendable nozzle? a) First increases, then decrease b) First decreases, then increase c) Keeps on increasing d) Keeps on decreasing	03	CO5
Q 9	What is ullage? a) The volume of propellant stored inside a tank neglecting its empty volume b) The extra volume of gas above the propellant in a tank c) The ratio of the volume of extra gas to that of the propellant after 50% of the propellant has been consumed d) The ratio of the volume of the propellant to that of the extra gas after 50% of the propellant has been consumed	03	CO4
Q 10	A good propellant tank must ensure that sloshing is _____ and vortexing is _____ a) minimized; maximized b) maximized; minimized c) maximized; maximized d) minimized; minimized	03	CO2
SECTION B			
Each question in the Section B is a Short-Answer Questions. Read each question and answer within 150-300 words. Marks [05x10=50]			
Q 11	How Combustion Instability occurs in the rocket engines and explain the methods to control Instabilities?	10	CO2
Q 12	How choking of the flow occurs in the conventional nozzles?	10	CO3
Q 13	In a liquid propellant rockets, what are different precautions taken to avoid the cavitation in the turbo-pumps.	10	CO4

	OR		
	What is the need for thrust vector control for rockets? List down the thrust vector control methods commonly employed in rocketry and explain any one of them.		
Q 14	Distinguish between storable and cryogenic propellants.	10	CO1
Q 15	Why is multi-staging necessary in rocket propulsion? What are the two stage and three stage optimal rockets with examples?	10	CO5
SECTION-C			
Section C is a Long-Answer Question. Read the question and answer within 900 words [Marks 20]			
Q 16	<p>Explain the working principle of the Nuclear Thermal Rocket Engine. Analyze the necessary steps taken for the management of its radiation and briefly explain the potential applications of nuclear engines.</p> <p style="text-align: center;">OR</p> <p>Illustrate the operating principles of different types of electrical thrusters. Analyze the operation of a Hall Effect Thruster by emphasizing on its various applications.</p>	20	CO5