

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination (Online), May 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	What will happen to thrust and specific impulse as the rocket is propelled to higher altitudes? a) Thrust decreases, specific impulse increases b) Thrust increases, specific impulse increases c) Thrust decreases, specific impulse decreases d) Thrust increases, specific impulse decreases	03	CO1
Q 2	Consider a rocket engine A and a jet engine B. Which of them will have higher specific impulse? a) A b) B c) B doesn't have a specific impulse d) A doesn't have a specific impulse	03	CO2
Q 3	If exhaust pressure is P_e and surrounding fluid pressure is P_a , what is the condition for the optimum expansion ratio of a rocket nozzle? a) $P_e = P_a$ b) $P_e < P_a$ c) $P_e > P_a$ d) $P_e = 0.5 * P_a$	03	CO3
Q 4	What kind of propulsion is used for trajectory adjustments and attitude corrections? a) Boosting propulsion b) Auxiliary propulsion c) Sustaining propulsion	03	CO1

	d) Cryogenic propulsion		
Q 5	Methane is a ____ fuel. a) Cryogenic hydrocarbon b) monopropellant c) bipropellant d) Hypergolic hydrocarbon	03	CO4
Q 6	Which of the following has metal oxide pyrotechnic composition? a) ZPP b) Ni-Al laminate c) ZHPP d) HMTD	03	CO4
Q 7	What is the nature of thrusters and feed system for attitude control rocket engines? a) small; common pressurized feed system b) large; separate turbopump feed system c) small; separate pressurized feed system d) large; common turbopump feed system	03	CO1
Q 8	A rocket engine moving at 500 m/s produces a total thrust of 9563 N, consuming propellants at the rate of 4.55 kg/s. The energy content of the propellants is 5.35 MJ/kg. Find the effective exhaust velocity. a) 2100 m/s b) 3936 m/s c) 1555 m/s d) 1400 m/s	03	CO2
Q 9	Which of the following types of engines use Xe (Xenon) as a typical working fluid? a) Resistojets b) Electro thermal c) Hall effect d) Nuclear fission	03	CO5
Q 10	Evaporation of the atomized droplets can happen due to heat transferred by ____ a) Radiation from rapid combustion zone, but not by convection from moderately hot gases in the first zone b) Radiation from rapid combustion zone and by convection from moderately hot gases in the first zone c) Convection from moderately hot gases in the first zone, but not by radiation from rapid combustion zone	03	CO2

	d) Neither radiation from rapid combustion zone nor by convection from moderately hot gases in the first zone		
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	Distinguish between storable and cryogenic propellants.	10	CO1
Q 12	What is the importance of igniters in rocket motors?	10	CO2
Q 13	Analyze the factors influencing injector behavior in the thrust chamber of Liquid Propellant rocket engines. OR Analyze the desirable propellant characteristics for the booster rocket motor with suitable propellant candidates.	10	CO4
Q 14	Write the advantages and Disadvantages of Gelled Propellants.	10	CO4
Q 15	Illustrate the physics of Lorentz force. Briefly explain the working principle of Lorentz Accelerator with emphasis on its applications.	10	CO5
SECTION-C			
Section C is a Long-Answer Question. Read the question and answer within 900 words [Marks 20]			
Q 16	Characterize the Electric Propulsion system and briefly explain them. Analyze the challenges faced by propulsion engineers while designing these systems. OR What is an Anti-satellite targeting missile? Analyze the propulsion systems used in these missions and briefly explain the Kessler syndrome proposed by Donald Kessler for LEO.	20	CO5