राष्ट्रीय प्रौद्योगिकी संस्थान गोवा

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech, First Semester.

End Semester Examinations, April-2021

Course Name: Elements of Mechanical Engineering	Course Code: **ME150**
Date: 09th April 2021	Time: 09:30 AM-12:30 PM
Duration: 3 Hours	Max. Marks: 100

ANSWER ALL QUESTIONS

(1)   Justify the application of welding technology in designing an automobile/racing car during B.Tech project. Define mechanical assembly and compare with joining process   (**10 Marks**)

(2)   What is soldering and brazing process? Differentiate between them using real life example with sketch. Also compare with braze soldering process.   (**10 Marks**)

(3)   What is fastener stress concentration? Explain through one example. Write down the mechanical aspect/understanding of adhesive bonding with diagram.   (**10 Marks**)

(4)   Write down the types of welding processes and broad applications of adhesive bonding with diagram. Under what circumstances would brazing or soldering be preferred over welding?   (**10 Marks**)

(5)   How welding of aluminium alloys are performed using MIG welding process? Write down the role of shielding gas. Compare MIG welding with TIG welding using neat sketch.   (**10 Marks**)

(6)   An ideal gas mixture consists of 2k-mol of N_2 and 4k-mol of CO_2. Evaluate the apparent gas constant of the mixture. Derive the relationship of Ideal gas equation.   (**5 Marks**)

(7)   Obtain the relation of work done in adiabatic process and isothermal process using diagram. A 0.8 m³ rigid tank contains gas of 500 kPa and

at 300 K. Gas is compressed isothermally to a volume of 0.1 m³. The work done on the gas during compression process is _____

(**10 Marks**)

(8) A mass of 1.5 kg of air is compressed in a quasi-static process from 0.1 MPa to 0.7 MPa for which PV=constant. The initial density of air is 1.16 kg/m3. Find work done by the piston to compress the air.

(**5 Marks**)

(9) What is quasi static process and comment on its engineering aspect? Proof that entropy is path independent for a reversible process. A heat engine working on Carnot cycle receives heat at the rate of 40 kW from a source at 1200 K and rejects it to sink at 300 K. Find heat rejected during the cyclic.

(**10 Marks**)

(10) What is Concept of continuum? Find Knudson number for N_2 at atmospheric pressure for flow in square cross-section having λ=75 nm. Take 5 different characteristic dimension and comment on evaluated parameter.

(**5 Marks**)

(11) What is Zeroth law? Explain in detail. How PMM type 1 and 2 are impossible machines and contributed role in evolution of thermodynamics Laws 1 and 2. An electric power generating station produces 400 MW. If the coal releases 36×10^8 kJ/h of energy, Find the rate of rejection of heat from the power plant.

(**15 Marks**)