B.Tech/
Integrated Dual Degree (B.Tech and M.Tech)
RBM2B001

2nd Semester Reg/Back Examination: 2022-23
Basic Mechanical Engineering
AEIE, AUTO, CHEM, CIVIL, CST, CSEAI, CSEDS, CSE, CSEAIME, EEE, ELECTRICAL,
ECE,ETC,EIE,IT,MECH,MME,METTA,MINERAL,AE,BIOTECH,ELECTRICAL & C.E
Time : 3 Hour
Max Marks : 100
Q. Code : M491
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

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Q1	**Answer the following questions:**	**(2 x 10)**
a)	Distinguish between flow work and displacement work.	
b)	Define critical point and triple point.	
c)	What is the difference between isentropic process and adiabatic process?	
d)	What is the function of clutch?	
e)	Show that the entropy of the universe is increasing.	
f)	Name two instruments for torque measurements.	
g)	How coupling differ from gearing?	
h)	What is the principle of strain gauge?	
i)	What is the DOF of a cylindrical joint used in a robot?	
j)	Which sensor is used to identify the distance between the obstacle and robot?	

Part-II

Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(6 × 8)**
a)	A reversible heat engine absorbs 1400KJ as heat from a source at 600^0C and delivers 700KJ as work and rejects the rest of the energy to a sink. Find the temperature of the sink.	
b)	20kg of water at 70^0C is heated at a constant pressure of 10 bar until it becomes superheated vapour at 300^0C. Find the changes in volume, enthalpy, internal energy and entropy.	
c)	Calculate the heat required to form 2.5kg of dry steam at 1.1 MPa from water at 40^0C. Determine the amount of heat removed at constant pressure to cause the steam to become 0.985 dry. Calculate the specific volume at respective conditions.	
d)	Draw T-S diagram of a Carnot cycle and explain the process.	
e)	Explain the different types of power transmission drives.	
f)	Explain the different types of brakes.	
g)	Explain the working of a cone clutch in an automobile.	
h)	Write short note on different types of gear drives you know.	

i) Write first and second laws of thermodynamics and make a comparison between the two.

j) A mass of air is initially at 260°C and 700 kPa, and occupies 0.028 m³ . The air is expanded at constant pressure to 0.084 m³ . A polytropic pocess with n = 1.5 is then carried out followed by a constant temperature process which completes a cycle. All the processes are reversible.
      i) draw the *p-v* diagram.
      ii) find the heat received and rejected in the cycle.

k) A cylinder-piston assembly shown below contains 0.1 m^3 of the gas at 1bar.

At this stage, the spring does not exert any force on the piston. The atmospheric pressure P_0 is 1 bar. Now the gas is heated until its volume is doubled. At this point the gas pressure is 4 bar. The area of the piston is 10^{-2} m². Determine the spring constant k.
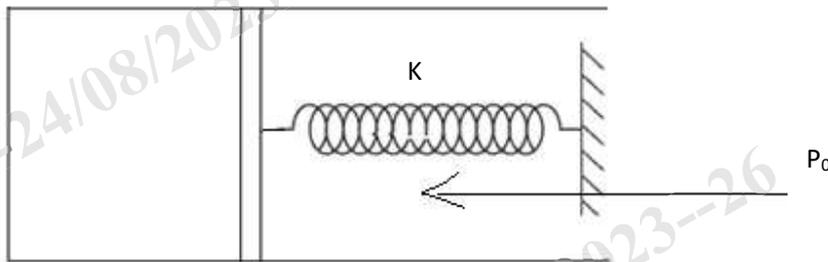
l) Discuss on common robot configurations.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Explain in detail with line diagram the working of a two stroke petrol engine.	**(8)**
	Explain the working principle of four stroke diesel engine.	**(8)**
Q4	Draw a schematic diagram to show different parts of a thermal power plant and explain their functions briefly.	**(16)**
Q5	Explain the function of a clutch and different types of clutches with their relative advantages and disadvantages	**(8)**
	Write short notes on	**(8)**
	(i) Strain measurement	
	(ii) Working principle of a refrigerator	
Q6	Show Robot anatomy with a neat diagram and briefly write the function of different components.	**(12)**
	Explain different types and joints usually present in a manipulator.	**(4)**