PAPER ID-311621

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BTECH
(SEM I) THEORY EXAMINATION 2023-24
FUNDAMENTALS OF MECHANICAL ENGINEERING

TIME: 3HRS   M.MARKS: 70

ote: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   Attempt *all* questions in brief.   2 x 7 = 14

a.	Write the characteristics of force.
b.	What do you mean by shear strain?
c.	Describe weakness of hybrid vehicles.
d.	What do you understand by total cylinder volume?
e.	A pressure of 2000 Pa is transmitted throughout a liquid column due to a force being applied on a piston. If the piston has an area of 0.1 m², what force is applied?
f.	Give example for a low head, medium head and high head turbine.
g.	Give the names of types of transducers based on quantity to be measured.

SECTION B

2.   Attempt any *three* of the following: 7 x 3 = 21

a.	A metallic wire ($Y = 20 \times 10^{10}$ N/m². and $\sigma = 0.26$) of length 3 m and diameter 0.1 cm is stretched by a load of 10 kg. Calculate the decrease in diameter of the wire.
b.	Explain the working of two stroke petrol engine with diagram.
c.	Explain the following: (i) DPT (ii) Comfort Conditions (iii) Specific Humidity
d.	Draw velocity triangle diagram for Pelton Wheel turbine. Differentiate between the turbines and pumps.
e.	Describe the construction and operation of a Prony brake dynamometer. And Derive the formula for break power of engine.

SECTION C

3.   Attempt any *one* part of the following: 7 x 1 = 7

a.	A beam 8 m. long is hinged at A and supported on roller over a smooth surface inclined at an angle 30^0 to the horizontal at B. The beam is loaded as shown in fig. Determine the support reactions.
b.	What is the shape of cross-section obtained after yielding in cases of brittle material? Explain in brief.

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4.   **Attempt any *one* part of the following:**   **7 x 1 = 7**

a.	Why an energy management control system is required in an HEV? Do you think an elaborate energy management system similar to that applied to a hybrid vehicle, is required in an electric vehicle? Explain.
b.	Give the types of energy storage technologies suitable for hybrid electric vehicle. Explain the lithium-ion batteries in detail.

5.   **Attempt any *one* part of the following:**   **7 x 1 = 7**

a.	With a neat sketch, explain the working principle of vapour compression Refrigeration system. Also draw T-s and P-h diagram
b.	A cold storage is to maintained at -5º C while the surroundings are at 35º C. The heat leakage from the surroundings into the cold storage is estimated to be 29 kW. The actual C.O.P. of the refrigeration plants is one-third of an ideal plant working between some temperatures. Find the power required to drive the plant.

6.   **Attempt any *one* part of the following:**   **7 x 1 = 7**

a.	Water flows through a pipe of internal diameter 20cm at the speed of 1m/s. What should the diameter of the nozzle be if the water is to emerge at the speed of 4m/s? By continuity equation.
b.	How does temperature affect the viscosity of a fluid? A square plate 0.1 m side moves parallel to second plate with a velocity of 0.1 ms^{-1}, both plates being immersed in water. If the viscous force is 0.002 N and the coefficient of viscosity 0.001 poise, what is the distance between the plates?

7.   **Attempt any *one* part of the following:**   **7 x 1 = 7**

a.	Explain with neat sketch optical pyrometer. Explain why an optical pyrometer for measuring high temperatures calibrated for an ideal blackbody radiation gives too low a value for the temperature of a red-hot iron piece in the open but gives a correct value for the temperature when the same piece in the furnace.
b.	What are the examples of mechatronic system? How does the evolution of mechatronics take place?