



HI-Tech Institute of Engineering and Technology, Ghaziabad

B.Tech (I/II Sem.)

Model Question Paper -1

Fundamentals of Mechanical Engineering (BME 101/201)

Time: 3 HOUR

Total Marks: 70

CO 1	Understand the concept of stress and strain, factor of safety, beams.
CO 2	Understand the basic component and working of internal combustion engines, electric and hybrid vehicles, refrigerator and heat pump, air conditioning.
CO 3	Understand fluid properties, conservation laws, hydraulic machinery used in real life.
CO 4	Understand the working principle of different measuring instrument with the knowledge of accuracy, error and calibration, limit, fit, tolerance and control system.
CO 5	Understand concept of mechatronics with their advantages, scope and Industrial application, the different types of mechanical actuation system, the different types of hydraulic and pneumatic systems.

SECTION-A

Q.1	Attempt all parts	(7×2=14)
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a.	The resultant of two forces $F_1 = 400$ N and $F_2 = 260$ N acting at point A is 520 N. Determine the angle between the two forces and the angle between the resultant and force F_1 .	CO1
b.	Define Bore and Stroke in I C Engine.	CO2
c.	Differentiate between refrigeration & air conditioning.	CO3
d.	Draw shear stress vs velocity gradient for Newtonian & non Newtonian fluid.	CO4
e.	Define dynamic & kinematic viscosity.	CO4
f.	Define the term accuracy, precision & resolution.	CO5
g.	Define autotronics, bionics & avionics.	CO5

SECTION-B

Q.2	Attempt any three parts	(3×7=21)
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a.	In a laboratory, tensile test is conducted and Young's modulus of the material is found to be 2.1×10^5 N/mm ² . On the same material torsion test is conducted and modulus of rigidity is found to be 0.78×10^5 N/mm ² . Determine Poisson's Ratio and bulk modulus of the material.	CO1
b.	Differentiate between SI & CI engine and two stroke & four stroke engine.	CO2
c.	Explain the terms (i) Human comfort condition (ii) Specific Humidity & Relative humidity (iii) WBT and DPT	CO3
d.	Define pumps. Explain construction & working of any one: (i) Centrifugal pump (ii) Reciprocating pump	CO4
e.	Explain Mechatronics with advantages, disadvantages, evolution & industrial applications.	CO5

SECTION-C

Q.3	Attempt any one part	(1×7=7)
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a.	Define elastic constant. Derive the relationship between elastic constant. (i) $E = 3K(1-2\mu)$ (ii) $E = 2G(1+\mu)$	CO1
b.	Draw stress-strain diagram for ductile & brittle material & explain each point.	CO1

Q.4	Attempt any one part	(1×7=7)
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a.	Explain the working of four stroke SI engine with sketch.	CO2
b.	Explain the working of two stroke CI engine with sketch.	CO2

Q.5	Attempt any one part	(1×7=7)
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a.	Explain the constructional detail & working of Window air conditioner.	CO3
b.	Explain the constructional detail & working of Domestic refrigerator.	CO3

Q.6	Attempt any one part	(1×7=7)
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a.	Define hydraulic turbine. Explain construction & working of Pelton turbine or Francis turbine.	CO4
b.	Write short notes on: (i) Continuity equation (ii) Pascal's law (iii) Specific gravity	CO4

Q.7	Attempt any one part	(1×7=7)
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a.	What are sensors & transducers? Enumerate various types of sensors & transducers. Explain any one in detail.	CO5
b.	What do you mean by actuation system? Write its classification & explain mechanical actuators.	CO5
c.	What is error in measurement? Explain various types of error.	CO5