PAPER ID-411599

Subject Code: KME101T

Roll No: | | | | | | | | | | | | | |

BTECH

(SEM I) THEORY EXAMINATION 2021-22

FUNDAMENTALS OF MECHANICAL ENGINEERING & MECHATRONICS

Time: 3 Hours ***Total Marks: 100***

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

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

Q. no.	Question	Marks	CO
a.	State Hooke's law.	2	1
b.	Discuss about superposition theorem.	2	1
c.	Discuss the terms used in IC engine - TDC, BDC, Stroke and Bore.	2	2
d.	Write the any six components of IC Engine.	2	2
e.	Discuss the equation of continuity.	2	3
f.	Write any four properties of fluid.	2	3
g.	Differentiate between precision and accuracy.	2	4
h.	What is the absolute pressure experienced by a pressure sensor, if the atmospheric pressure of a fluid is 2 atm, gauge pressure is 5 atm and differential pressure is 3 atm?	2	4
i.	Differentiate active and passive transducers.	2	5
j.	What is the function of an accumulator?	2	5

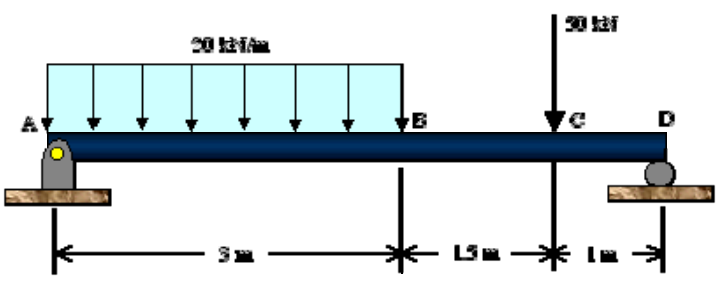
SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

Q. no.	Question	Marks	CO
a.	Draw S.F.D. and B.M.D. for simply supported beam carrying uniformly distributed load W (KN/m) throughout its length L (m). What is the maximum bending moment?	10	a 1
b.	Explain the working of four stroke petrol engine with diagram.	10	2
c.	Explain the working and construction details of reciprocating pump.	10	3
d.	Explain the construction and working of optical pyrometer.	10	4
e.	Discuss the various key elements of a mechatronics system and write any four-mechatronics system.	10	5

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

Q. no.	Question	Marks	CO
a.	Draw S.F.D. & B.M.D. for fig. shown below- 	10	1
b.	Develop the relationship between E (Young's modulus), C (Shear modulus), K (Bulk modulus) and μ (Poisson ratio).	10	1

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4. Attempt any *one* part of the following: 10 x 1 = 10

Q. no.	Question	Marks	CO
a.	Compare the following- (i) SI Engine and CI Engine (ii) 4-stroke Engine and 2-stroke Engine	10	2
b.	Explain the working of vapour compression refrigeration system by T-S diagram with related block diagram.	10	2

5. Attempt any *one* part of the following: 10 x 1 = 10

Q. no.	Question	Marks	CO
a.	What are the parts of venture meter? Derive a formula to measure the rate of flow of a liquid through venturi meter. $$Q = \frac{a_1 a_2}{\sqrt{a_1^2 - a_2^2}} \sqrt{2gh}$$	10	3
b.	What is Turbine? Explain construction details of Pelton Turbine with diagram.	10	3

6. Attempt any *one* part of the following: 10 x 1 = 10

Q. no.	Question	Marks	CO
a.	Explain in detail with suitable diagram – (i) Limit and their types (ii) Fits and their types.	10	4
b.	Define pressure. Write the classification of pressure measurement instruments. Explain the working of bourdon tube pressure gauge with neat sketch.	10	4

7. Attempt any *one* part of the following: 10 x 1 = 10

Q. no.	Question	Marks	CO
a.	What is Sensor? Explain classification of sensors based on various Inputs and Outputs.	10	5
b.	Explain different types of “Mechanical Actuation system” based on power inputs.	10	5

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Subject Code: KME201T

Roll No: | | | | | | | | | | | | | |

BTECH

(SEM II) THEORY EXAMINATION 2021-22

FUNDAMENTALS OF MECHANICAL ENGINEERING & MECHATRONICS

Time: 3 Hours ***Total Marks: 100***

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

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

Q. No.	Questions	CO
a.	Define Young's modulus, Bulk modulus and Poisson's ratio.	1
b.	Define point of contra-flexure.	1
c.	Define scavenging process in IC Engine.	2
d.	List the components of a vapor compression refrigeration system and show them in sequence on a block diagram.	2
e.	Define specific gravity of a fluid.	3
f.	Describe the range and span of a measuring instrument.	3
g.	Explain the calibration in measurement.	4
h.	Differentiate between gauge pressure and absolute pressure.	4
i.	Define mechatronics and its key elements.	5
j.	Write any four mechanical actuators.	5

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

Q. No.	Questions	CO
a.	Draw S.F.D. and B.M.D. for cantilever beam carrying a uniformly distributed load W (KN/m) throughout its length L (m). What is the maximum bending moment?	1
b.	Explain the working of four stroke CI engine with P-V diagram and with suitable sketch.	2
c.	Describe the turbine and its classification with example. Explain the working and construction details of Kaplan Turbine.	3
d.	Define Pressure. Explain the construction and working of Bourdon Tube pressure gauge.	4
e.	Define mechanical actuators. Explain the following in brief: (i) Kinematic chain (ii) Gear and its types (iii) Cam-Follower, and its types	5

SECTION C

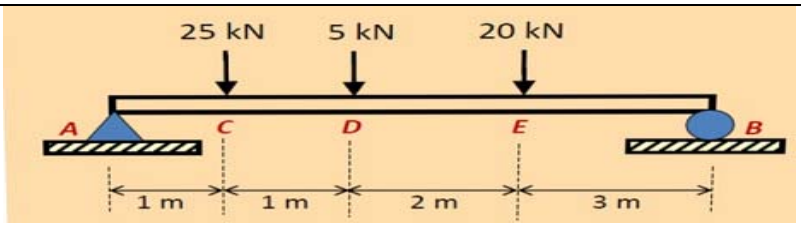
3. Attempt any *one* part of the following: **10 x 1 = 10**

Q. No.	Questions	CO
(a)	Calculate the shear force and bending moment for the beam subjected to the loads as shown in the figure then draw the shear force diagram (SFD) and bending moment diagram (BMD).	1

BTECH

(SEM II) THEORY EXAMINATION 2021-22

FUNDAMENTALS OF MECHANICAL ENGINEERING & MECHATRONICS

		
(b)	A composite bar of uniform cross-section area 200 mm^2 consists of an aluminum section rigidly fastened between a bronze section and a steel section as shown in figure. Axial loads are applied at the positions indicated. Determine: the Axial load P (kN) to make it in equilibrium, Stress in each section and the total change in length of the bar. Given: E_{Bronze} = 100GPa, E_{Al} = 70GPa, E_{Steel} = 200GPa. 	1

4. Attempt any *one* part of the following: 10 x 1 = 10

Q. No.	Questions	CO
(a)	Explain basic components and working of Window Air Conditioner.	2
(b)	What do you mean by refrigeration? Explain basic components and working of domestic refrigerator with suitable sketch.	2

5. Attempt any *one* part of the following: 10 x 1 = 10

Q. No.	Questions	CO
(a)	Describe the Pascal Law. Explain the working of Hydraulic Lift with the help of a neat diagram.	3
(b)	With a neat sketch illustrate the construction and working of Centrifugal Pump.	3

6. Attempt any *one* part of the following: 10 x 1 = 10

Q. No.	Questions	CO
(a)	Define error in measurement. Discuss different types of errors in measurement in detail.	4
(b)	Briefly explain temperature measuring device based on the principle of radiation with neat sketch.	4

7. Attempt any *one* part of the following: 10 x 1 = 10

Q. No.	Questions	CO
(a)	Differentiate between (i) Open loop control system and Close loop control system. (ii) Hydraulic system and Pneumatic system.	5
(b)	Explain directional control valve and its significance with neat sketch.	5