

Enrollment No.....



Faculty of Engineering
End Sem (Even) Examination May-2018
EN3ES03 Basic Mechanical Engineering

Programme: B. Tech.

Branch/Specialisation: All

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1
- i. The product of blast furnace is called 1
(a) Cast iron (b) Wrought iron (c) Pig iron (d) Steel
 - ii. Identify the most important parameter by which lathe machine is specified 1
(a) Distance between centers
(b) Length of bed
(c) Maximum speed of spindle
(d) Maximum diameter of job it can swing
 - iii. Which one of the following properties given below is an extensive property of the system? 1
(a) Pressure (b) Temperature (c) Volume (d) Density
 - iv. The capacity of refrigeration machine is expressed as 1
(a) The lowest temperature attainable
(b) Rate of abstraction of heat from space being cooled
(c) Inside volume of the cabin
(d) Gross weight of the machine in tones
 - v. Identify the boiler mounting 1
(a) Super heater (b) Feed check valve
(c) Air preheater (d) Economizer
 - vi. Which of the following process is not associated with a theoretical diesel cycle 1
(a) Constant volume (b) Constant pressure
(c) Isothermal (d) Adiabatic

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- vii. The centroid of a body **1**
 (a) Must be a point on that body
 (b) Is a point which can lie on or outside the body by changing the coordinate system
 (c) Is a unique point fixed with respect to the body
 (d) None of these
- viii. Moment of inertia "I" of a triangular section of height "h" and base "b" about an axis passing through its base is given by **1**
 (a) $I = bh^3 / 12$ (b) $I = bh^3 / 36$
 (c) $I = bh^3 / 4$ (d) $I = bh^3 / 16$
- ix. Law of machine gives **1**
 (a) Relation between load and effort
 (b) Relation between load and efficiency
 (c) Relation between efficiency and effort
 (d) None of these
- x. Power transmitted by a belt or rope is given by **1**
 (a) $P = (T_1 - T_2) V$ (b) $P = (T_{max} - T_{(C)}) V$
 (c) $P = (T_1 + T_2) V$ (d) None of these

- Q.2 i. Define accuracy and precision. **2**
 ii. State the principle of working in a lathe machine. **3**
 iii. A steel wire 2 m long and 3 mm in diameter is extended by 0.75 mm due to weight suspended from the wire. If the same weight is suspended from the brass wire, 2.5 m long and 2 mm in diameter, it is elongated by 4.65 mm. Determine the young modulus of elasticity of brass if that of steel is $2 \times 10^5 \text{ N/mm}^2$. **5**

OR iv. Sketch the iron carbon equilibrium diagram and point out salient features. **5**

- Q.3 i. List the limitations of the first law of thermodynamics. **2**
 ii. Define the following terms **3**
 (a) Triple point (b) Dryness fraction (c) Latent heat
 iii. Explain the process of steam generation from water at constant pressure. Show the various stages on T – h diagrams. **5**

[3]

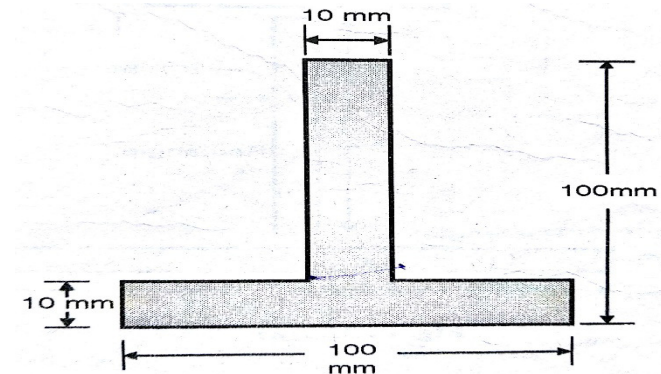
OR iv. A cold storage is to be maintained at -5°C while the surroundings are at 35°C . The heat leakage from the surroundings into the cold storage is to be 29 kJ/s and the actual COP of the refrigeration plant is one third of an ideal plant working between the same temperature limits, finds the power required in kW to drive the plant. **5**

Q.4 i. Differentiate between SI engine and CI engine.(any three point) **3**
 ii. Obtain an expression for draught produced in mm of water column when the discharge is maximum. **7**

OR iii. Derive an expression for the air standard efficiency of Otto cycle. State the assumption made. **7**

Q.5 i. Distinguish between centre of gravity and centroid. **3**
 ii. Find the position of centroid of an unequal angle section (L-Section) with dimensions 200 mm x 150 mm x 10 mm. Longer leg is vertical. **7**

OR iii. Determine the moment of inertia of the section shown in figure about an axis passing through its centroid and parallel to the base. **7**



Q.6 Attempt any two: **5**
 i. Derive the ratio of tension on tight side and slack sides of a pulley. **5**
 ii. Derive the expression for length of an open belt drive. **5**
 iii. Find the length of the belt required for driving pulleys in a cross belt drive 600 mm and 300 mm diameter when 2.4 m apart. Take thickness of belt as 5 mm. **5**

Marking Scheme

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Q.1	i. (c) Pig iron	1			(1 mark *3)	3
	ii. (d) Maximum diameter of job it can swing	1			1 mark	7
	iii. (c) Volume	1			1 mark	
	iv. (b) Rate of abstraction of heat from space being cooled	1			Derivation for maximum discharge	5 marks
	v. (b) Feed check valve	1			OR	
	vi. (c) Isothermal	1			iii. What is Otto cycle	1 mark 7
	vii. (c) Is a unique point fixed with respect to the body	1			P-V and T-S diagram of Otto cycle	2 marks
	viii. (a) $I = bh^3 / 12$	1			Derivation for air standard efficiency	3 marks
	ix. (a) Relation between load and effort	1			Assumptions(any two)	1 mark
	x. (a) $P = (T_1 - T_2) V$	1			Q.5	
Q.2	i. Accuracy	1 mark	2		i. Difference between centroid and centre of gravity	3
	Precision	1 mark			Each rite difference one mark	(1 mark*3)
	ii. Definition of lathe machine	1 mark	3		ii. Sketch of L-section with dimensions	2 marks 7
	Diagram	1 mark			Distances of centroid from X axis	3 marks
	Principle of working	1 mark			Distances of centroid from Y axis	2 marks
	iii. Sketch of wire	1 mark	5		OR	
	Calculation for steel wire	2 marks			iii. Sketch of T-section with dimensions	1 mark 7
	Calculation for brass wire	2 marks			Distances of centroid from Y axis	2 marks
OR	iv. Introduction of iron carbon diagram	1 mark	5		The moment of inertia of the section	4 marks
	Sketch of iron carbon diagram	3 marks			Q.6	
	features of iron carbon diagram	1 mark			Attempt any two:	
Q.3	i. Any two limitations	(1 mark *2)	2		i. Sketch of Pulley with parameters	1 mark 5
	ii. Define the terms		3		Derivation for ratio of tensions	4 marks
	a) Triple point	1 mark			ii. Sketch of open belt drive	1 mark 5
	b) Dryness fraction	1 mark			Derivation for length of belt	4 marks
	c) Latent heat	1 mark			iii. Given data with diagram of cross belt	1 mark 1
	iii. What is steam	1 mark	5		Formula	1 mark 1
	Process of steam generation	2 marks			Calculations	3 marks 3
	Stages on T – h diagrams.	2 marks				
OR	iv. Given data's with sketch of system	2 marks	5		*****	
	Actual COP and Ideal COP	1 mark				
	Power required in kW	2 marks				