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Enrollment No.....



Faculty of Engineering
End Sem (Even) Examination May-2019
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
- Total area under the stress strain curve gives: **1**
(a) Toughness (b) Strength (c) Resilience (d) Stiffness
 - Failure of material due to constant load at high temperature is called: **1**
(a) Creep (b) Fatigue
(c) Stress Concentration (d) Corrosion
 - Dryness fraction along the saturated Vapour curve is: **1**
(a) 1 (b) 0
(c) Between 0 and 1 (d) All of these
 - Which of the following is intensive property? **1**
(a) Kinetic energy (b) Density
(c) Enthalpy (d) Entropy
 - The compression ratio for petrol engine as compare to diesel engine is: **1**
(a) Higher (b) Lower (c) Same (d) None of these
 - The stroke volume is 500 CC. The clearance is 50 CC. The compression ratio is: **1**
(a) 10 (b) 11 (c) 9 (d) 15
 - The height of the centroid above the diameter of a semicircle area is **1**
(a) r/π (b) $4r/3\pi$ (c) $3r/4\pi$ (d) None of these
 - Moment of inertia of rectangular section having width (b) and depth (d) about an axis passing through its C.G. and parallel to base (b), is **1**
(a) $db^3/12$ (b) $bd^3/12$ (c) $db^3/36$ (d) $bd^3/36$

P.T.O.

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- ix. The power transmitted by the belt drive is (T_1 = Tension on tight side, T_2 = Tension on slack side, v = linear velocity of belt, ω = angular velocity) **1**
 (a) $(T_1 - T_2) \times v$ (b) $(T_1 - T_2)/v$ (c) $(T_1 - T_2) \times \omega$ (d) $(T_1 - T_2)/\omega$
- x. The centrifugal tension in the belt is given by (m = mass of belt per unit length, v = linear velocity of belt) **1**
 (a) mv^2 (b) $3mv^2$ (c) m/v^2 (d) None of these
- Q.2 i. List all the mechanical properties of engineering materials. **4**
 ii. A hollow cylinder 2 m long has an outside diameter of 50 mm and inside diameter of 30 mm. If the cylinder is carrying a load of 25 KN, find the stress in the cylinder. Also find the deformation of the cylinder, if the value of E for the cylinder material is 100 GPa. **6**
- OR iii. Describe the construction and working of Vernier Calliper with neat sketch. **6**
- Q.3 i. Explain Extensive and Intensive properties with examples. **2**
 ii. Write Kelvin-Planck and Clausius statements of second law of thermodynamics. **3**
 iii. Find the enthalpy and entropy of steam when the pressure is 20 bars and specific volume is $0.09 \text{ m}^3/\text{kg}$. **5**
- OR iv. Explain the working of Vapour Compression Refrigeration System with neat sketch. **5**
- Q.4 i. List any two Mountings and Accessories. **2**
 ii. Give any three comparisons between petrol and diesel engines. **3**
 iii. Explain the working principle of two stroke petrol engine with neat sketch? **5**
- OR iv. Write the working principle of Cochran Boiler with neat sketch. **5**
- Q.5 i. State and prove the parallel axis theorem. **4**
 ii. Find the moment of inertia of the section (Fig.1) about the horizontal axis passing through the centroid. **6**

[3]

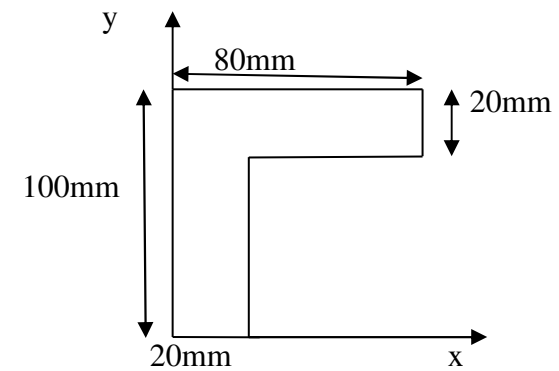


Fig.1

- OR iii. Derive an expression for moment of inertia for rectangle having base (b) and depth (d) about Centroidal axes. **6**
- Q.6 i. Define load, velocity ratio, effort and mechanical advantage. **4**
 ii. The initial tension in a flat belt drive is 1800 N. the angle of lap is 170° , the coefficient of friction between the belt and pulley surface is 0.25. The pulley has the diameter of 0.9 meter and it runs at a speed of 540 rpm. Determine the power that can be transmitted. **6**
- OR iii. For a flat belt, prove that $\frac{T_1}{T_2} = e^{\mu\theta}$ **6**
 T_1 = Tension in the tight side of the belt,
 T_2 = Tension in the slack side of the belt,
 μ = Coefficient of friction between the belt and the pulley, and
 θ = Angle of contact between the belt and the pulley (in radians.)

Marking Scheme
EN3ES03 Basic Mechanical Engineering

Q.1	i.	Total area under the stress strain curve gives: (a) Toughness	1
	ii.	Failure of material due to constant load at high temperature is called: (a) Creep	1
	iii.	Dryness fraction along the saturated Vapour curve is: (a) 1	1
	iv.	Which of the following is intensive property? (b) Density	1
	v.	The compression ratio for petrol engine as compare to diesel engine is: (b) Lower	1
	vi.	The stroke volume is 500 CC. The clearance is 50 CC. The compression ratio is: (b) 11	1
	vii.	The height of the centroid above the diameter of a semicircle area is (b) $4r/3\pi$	1
	viii.	Moment of inertia of rectangular section having width (b) and depth (d) about an axis passing through its C.G. and parallel to base (b), is (b) $bd^3/12$	1
	ix.	The power transmitted by the belt drive is (T_1 = Tension on tight side, T_2 = Tension on slack side, v = linear velocity of belt, ω = angular velocity) (a) $(T_1-T_2) \times v$	1
	x.	The centrifugal tension in the belt is given by (m = mass of belt per unit length, v = linear velocity of belt) (b) $3mv^2$	1
Q.2	i.	List all the mechanical properties of engineering materials. 0.5 mark for each property (0.5 mark * 4)	4
	ii.	Find the deformation of the cylinder Given 1 mark Formula 1 mark Stress 2 marks Deformation 2 marks	6
OR	iii.	Construction and working of Vernier Calliper Working principle 3 marks Diagram 3 marks	6

Q.3	i.	Definition and Example Extensive properties 1 mark Intensive properties 1 mark	2
	ii.	Second law of thermodynamics. Kelvin Plank 1.5 marks Clausius Statement 1.5 marks	3
	iii.	Dryness fraction 1 mark Data form steam table 1 mark Enthalpy 1.5 marks Entropy 1.5 marks	5
	OR	iv. Vapour Compression Refrigeration System Diagram 3 marks Working 2 marks	5
Q.4	i.	Any two Mountings and Accessories. 1 mark for each (1 mark * 2)	2
	ii.	Any three comparisons between petrol and diesel engines. 1 mark for each difference (1 mark * 3)	3
	iii.	Working principle of two stroke petrol engine Diagram 3 marks Working 2 marks	5
	OR	iv. Working principle of Cochran Boiler Diagram 3 marks Working 2 marks	5
Q.5	i.	State and prove the parallel axis theorem. Statement 1 mark Proof 3 marks	4
	ii.	Find the moment of inertia of the section (Fig.1) about the horizontal axis passing through the centroid. C. G. Formula 1 mark C.G. 2 marks M. I. Formula 1 mark M.I. 2 marks	6
	OR	iii. Derive an expression for moment of inertia for rectangle having base (b) and depth (d) about Centroidal axes. Ixx 3 marks Iyy 3 marks	6

Q.6	i.	Define load, velocity ratio, effort and mechanical advantage.	4
		1 mark for each (1 mark * 4)	
	ii.	Determine the power that can be transmitted.	6
		Velocity formula 1 mark	
OR		T ₁ , T ₂ 2 marks	
		Power 3 marks	
	iii.	For a flat belt, prove that $\frac{T_1}{T_2} = e^{\mu\theta}$	6
		Force Diagram 2 marks	
		Writing Equation 1 mark	
		Derivation after Writing Equation 3 marks	
