Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination Dec-2023

EN3ES18 / BC3ES05 Basic Mechanical Engineering

Programme: B.Tech. / B.Sc. 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. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Area under the stress and strain curve up to the elastic point is known as- **1**
(a) Toughness (b) Hardness (c) Resilience (d) Brittleness

ii. The ferrous alloys with less than 1.5% Carbon are termed as- **1**
(a) White Cast Iron (b) Steel
(c) Grey Cast Iron (d) None of these

iii. Which one of the property is an intensive property? **1**
(a) Viscosity (b) Density
(c) Volume (d) Both (a) and (b)

iv. Characteristic feature of a quasi-static process- **1**
(a) Infinite slowness (b) Rapidity
(c) Stability (d) Stationary existence

v. In 2- Stroke engine cam shaft rotates at- **1**
(a) Half of crankshaft rotation
(b) Twice of crank shaft rotation
(c) Same as of crankshaft rotation
(d) There is no any cam shaft

vi. In an I.C. Engine, Flywheel supplies energy in- **1**
(a) Suction, Compression & Expansion stroke
(b) Suction, Compression & Exhaust stroke
(c) Compression, Expansion & Exhaust stroke
(d) Suction, Expansion & Exhaust stroke

vii. Select odd one out from the following- **1**
(a) Pressure gauge (b) Steam stop valve
(c) Economiser (d) Fusible plug

P.T.O.

viii. Which one of the following has two fire tube in a boiler drum? **1**
(a) Cochran boiler (b) Lancashire
(c) Cornish boiler (d) Babcock and Wilcox boiler

ix. What is the centroidal distance of an equilateral triangle of height 12 from the apex? **1**
(a) 3 (b) 6 (c) 8 (d) 9

x. The moment of inertia of a composite figure is find out by- **1**
(a) Parallel axis theorem (b) Lami's theorem
(c) Varignon's theorem (d) All of these

Q.2 i. What is the purpose of testing engineering materials? **2**

ii. Draw and explain stress and strain diagram for mild steel. **3**

iii. A steel bar 1.5 m long, 50 mm wide and 20 mm thick is subjected to axial tensile load of 120 kN. Find stress and strain on the bar if the extension in the bar is 0.5 mm. **5**

OR iv. Enlist various types of cast iron. Write their properties and applications. **5**

Q.3 i. Explain Joule's paddle wheel experiment. **2**

ii. 0.2 m^3 of ideal gas at a pressure of 2 MPa and 600 K is expanded isothermally to five times its initial volume. It is then cooled to 300 K at constant volume and then compressed polytropically to its initial state. Determine the net work done and heat transfer during the cycle. **8**

OR iii. A system contains 0.15 m^3 of air pressure of 3.8 bars and 150 ºC. It is expanded adiabatically till the pressure falls to 1.0 bar. The air is then heated at a constant pressure till its enthalpy increases by 70 kJ. Determine the total work done. **8**
Use. cp=1 kJ /kg.K and cv=0.714 kJ /kg.K

Q.4 i. Explain the working of four stroke petrol engine. **4**

ii. A diesel engine working on Diesel cycle has stroke of 95 mm and bore of 100 mm. The compression ratio of the engine is 23. Find the efficiency of the air standard cycle, if the injection of fuel is done for 10% of the stroke. **6**

OR iii. A four-stroke engine has a stroke of 90 mm and bore of 100 mm. The clearance volume is 70 cc. The engine works on Otto cycle. Determine theoretical efficiency of the engine. **6**

Q.5 i. Define the following terms- **4**
(a) Boiler draught (b) Equivalent evaporation

ii. How boilers are classified? Name boiler mounting and explain one of them. **6**

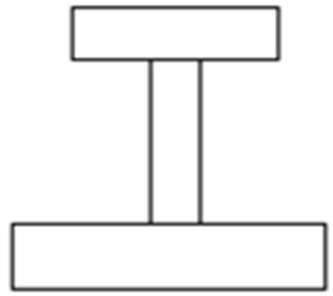
OR iii. Describe the classification, construction and working of a Cochran boiler. **6**

Q.6 Attempt any two:

i. State and prove parallel axis theorem. **5**

ii. Derive the expression for moment of inertia of rectangular plate about its centroidal axes. **5**

iii. Find Centroid of I-section with top flange 150 mm * 20 mm, web 200 mm * 20 mm, and bottom flange 300 mm * 30 mm. **5**



******

Scheme of Marking

Basic Mechanical Engineering (T) - EN3ES18 (T)

Q.1	i)	Resilience	**1**
	ii)	Steel	**1**
	iii)	Both A and B	**1**
	iv)	Infinite slowness	**1**
	v)	There is no any Cam shaft	**1**
	vi)	Suction, Compression & Exhaust stroke	**1**
	vii)	Economiser	**1**
	viii)	(b) Lancashire	**1**
	ix)	8	**1**
	x)	(a) Parallel axis theorem (c) Varignon's theorem	**1**
Q.2	i.	For each point 0.5 mark	**2**
	ii.	For diagram 1 mark and 2 marks for explanation	**3**
	iii.	Stress= 120 N/mm^2 2.5 marks strain = 3.33 x 10^{-4} 2.5 marks	**5**
OR	iv.	1 mark for classification and 1 for each explanation	**5**
Q.3	i.	1 mark for diagram and 1 mark for explanation	**2**
	ii.	2 marks for each process work done and 2 marks for heat supplied to system. Net work done= 181.9kJ, for cyclic process net work done= heat transfer=181.9kJ. work done for process 1-2= 643.78kJ, work done for process 2-3= 0kJ, work done for process 3-1= - 461.9kJ	**8**
OR	iii.	Total work done = 65KJ, for each process work done 4 marks, Adiabatic work done = 45KJ, isobaric work done= 20KJ	**8**
Q.4	i.	1 mark for each difference	**4**
	ii.	3 marks for cut-off ratio and 3 marks for efficiency calculation. volume at the end of fuel injection= 107.05 cm^3 Cut-off ratio=3.3 and efficiency = 61.7%,	**6**
OR	iii.	3 marks for compression ratio calculation and 3 marks for efficiency calculation. Compression ratio=11.1 and efficiency=62.8%	**6**
Q.5	i.	2 marks for each definition	**4**
	ii.	For boiler classification 2 marks, 2 marks for boiler mounting and 2 marks for explanation.	**6**
OR	iii.	2 marks for each classification, construction and working	**6**
Q.6			
	i.	2 marks for statement and 3 marks for proof	**5**
	ii.	2.5 marks for moment of inertia with respect to each axis.	**5**
	iii.	1 mark for diagram and 2 marks for $\bar{X}$=150mm and 2 marks for each $\bar{Y}$=85.9mm	**5**

******