

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-I & II(NEW) EXAMINATION – WINTER 2022****Subject Code:3110006****Date:03-03-2023****Subject Name:Basic Mechanical Engineering****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.
5. Steam Table is allowed

- Q-1** (a) Define Specific heat and enthalpy. **03**
(b) Explain different between renewable and non-renewable energy. **04**
(c) Define adiabatic process. Prove that $pV^\gamma = \text{constant}$ **07**

- Q-2** (a) Explain classification of engineering materials. **03**
(b) Explain with neat sketch the working of fast and loose pulley. **04**
(c) How much heat to be added to convert 4kg water at 20⁰ C into steam at 8bar and 200⁰ C. take C_p of superheated steam as 2.1KJ/kg and specific heat of water of water as 4.187KJ/kgK. **07**

OR

- (c) 1kg of air at 7bar pressure and 90⁰C temperature undergoes a non flow polytropic process. The law of expansion is $pV^{1.1} = \text{constant}$. The pressure falls to 1.4bar during process. Calculate: (1) final temperature (2) Work done (3) change in internal energy (4) heat exchange take $R = 287\text{J/kg K}$ and $\gamma = 1.4$ for air. **07**

- Q-3** (a) Explain with neat sketch throttling calorimeter. **03**
(b) Explain different between fire tube boiler and water tube boiler. **04**
(c) Derive equation for efficiency of constant pressure heat addition cycle. **07**

OR

- Q-3** (a) Explain dryness fraction of steam. **03**
(b) The engine working on ideal Otto cycle. The temperature at the beginning and at the end of compression is 50⁰ C and 400⁰ C. Calculate the air standard efficiency and compression ratio. **04**
(c) Explain with neat sketch Cochran boiler. **07**

- Q-4** (a) Draw net figures of any three types of belt drive. **03**
(b) What are the uses of compressed air? **04**
(c) The following reading were taken during the test on a single cylinder four stroke oil engine : **07**
Cylinder diameter = 270 mm
Stroke length = 380 mm
Mean effective pressure = 6 bar
Engine speed = 250 rpm
Net load on brake = 1000 N
Effective mean diameter of brake = 1.5 m
Fuel used = 10 kg/hr
C.V of fuel = 44400KJ/kg
Calculate: (1) Brake power

- (2) Indicated power
- (3) Indicated thermal efficiency.

OR

- Q-4**
- (a) Write function of clutch, Break and Coupling. **03**
 - (b) Classify internal combustion Engine. **04**
 - (c) Two cylinder four stroke diesel has total swept volume of 870cm^3 following data available with test on the engine. **07**
Engine speed = 300rpm
Brake torque = 50 N-m
 $p_m = 10\text{bar}$
calculate (1) indicated power
(2) brake power
(3) Mechanical efficiency
- Q-5**
- (a) Explain difference between belt drive and chain drive **03**
 - (b) Explain with the help of neat sketches, the working of two stroke petrol engine. **04**
 - (c) Explain vapour compression refrigeration cycle. **07**
- OR**
- Q-5**
- (a) Define the following mechanical properties **03**
(i) Ductility (ii) Hardness (iii) Plasticity
 - (b) What is coupling? Explain internal expanding shoe brake with a neat sketch? **04**
 - (c) What is priming? Explain with neat sketch centrifugal pump. **07**