# Question Paper

Exam Date & Time: 24-Feb-2023 (09:30 AM - 12:30 PM)

## MANIPAL ACADEMY OF HIGHER EDUCATION

**FIRST SEMESTER B.TECH. EXAMINATIONS - FEBRUARY/MARCH 2023**
**SUBJECT: MIE 1071 / MIE-1071 - BASIC MECHANICAL ENGINEERING**
**(MAKEUP)**

**Marks: 50** **Duration: 180 mins.**

**Answer all the questions.**

| | | |
|---|---|---|
| 1A) | Dry saturated steam at a pressure of 1 MPa is generated in a boiler. Dry saturated steam leaves the boiler to enter a super heater, and in the transit, it loses heat equal to 400 kJ/kg. In the super heater, steam is super-heated to temperature of 300°C. If temperature of feed water is 28°C, determine:<br>a) Total heat supplied to feed water in the boiler<br>b) Dryness fraction of steam at the entry of super heater<br>c)Total heat supplied in the super heater. | (4) |
| 1B) | Two boilers one with super heater and another without a super heater are delivering equal quantities of steam into a common main. The pressure in the boiler and in the main is 20 bar. The temperature of the steam from a boiler with the superheater is 350°C and the temperature of steam in the main is 250°C. Determine the quality of steam supplied by the other boiler. | (3) |
| 1C) | Explain the functions of an economizer and air preheater. | (3) |
| 2A) | An open belt running over two pulleys 1.5m and 1.0m diameter connects two parallel shafts which are 4.80m apart. The initial tension in the belt when it is stationary is 3000N. If the smaller pulley is rotating at 600 rpm and coefficient of friction between the belt and pulley is 0.3, determine the power transmitted. | (4) |
| 2B) | In a compound gear train, wheels A, B, C and D have 15,30,20,40 teeth respectively. The wheel B and C are keyed to the same shaft. If the wheel A runs at 400 rpm, find the speed of wheel D. Sketch the arrangement if B meshes with A and C meshes with D. | (3) |
| 2C) | Sketch and explain the working of a fast and loose pulley. | (3) |
| 3A) | From a test on a four-stroke petrol engine, the following data is available: engine speed 1000 rpm, net braking torque 70 Nm, indicative mean effective pressure 10 bar, stroke 150 mm, bore 100 mm, rate of fuel consumption 2.57 kg/h, CV of petrol 41000 kJ/kg. Calculate the indicated thermal efficiency, brake thermal efficiency and mechanical efficiency. | (4) |
| 3B) | A six-cylinder, four stroke IC engine develops 100 KW of brake power at 800 rpm. The stroke to bore ratio is 1.5. The indicated mean effective pressure is 8 bar and mechanical efficiency is 80 %. Determine the cylinder diameter and piston stroke of the engine. | (3) |
| 3C) | Compare four stroke engines with two-stroke engines. List any six points. | (3) |
| 4A) | Explain the functions of compound rest, cross slide, lead screw and feed rod in a lathe. | (4) |
| 4B) | A hole of 30 mm diameter with internal threading needs to be created in a flat workpiece of thickness 30 mm. With neat sketches, explain the major machining operations that are required to be carried out to achieve the same. | (3) |
| 4C) | Explain the problems associated with NC machine. | (3) |
| 5A) | Explain the characteristics of wood and metal as pattern materials in casting process. | (4) |

| | | |
|---|---|---|
| 5B) | Two iron plates of thickness 20 mm need to be joined which is to be used in an application where the joint experiences large amount of force. The electrodes available are flux coated. Suggest a suitable welding process and explain the same with neat labelled sketch. | (3) |
| 5C) | Explain the advantages and limitations of a CNC machine. | (3) |

-----End-----