Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH (MECHANICAL/I&P ENGG.) END SEMESTER MAKE-UP EXAMINATIONS, DECEMBER 2018

SUBJECT: DESIGN OF MECHANICAL SYSTEMS [PE-VI] [MME 4002]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL the** questions.
- Missing data may be appropriately assumed.
- Assumptions made must be clearly mentioned.
- Use of Design Data Hand Book is allowed.

1. Design the left side flange of protected flange coupling transmitting 75 kW at 500 rpm. The diameter of shaft is 90 mm. The minor diameter of bolt is 23 mm. The permissible tensile strength for steel and cast iron may be taken as 120 MPa and 100 MPa respectively. Consider an overload of 25% and neglect the design of key. **(05)**

2. An automobile has a single plate clutch to transmit 33 kW at 2000 rpm. The ratio of mean diameter to radial width of clutch plate is 4.5:1. Determine the diameters of the clutch plate. **(05)**

3. The diameter of piston of an IC engine is 80 mm .The Stroke length is 140 mm. The maximum explosion pressure is 3 MPa. Take allowable tensile stress as 120 MPa and allowable shear stress as 80 MPa. Determine the diameter of the pin region of overhung crankshaft **(05)**

4. The pitch circle diameter of the pulley used for a passenger lift is 800 mm. The pulley has 6 arms of cross shaped section having web thickness of 12 mm. The tight and slack side tensions in the rope are 9896 N and 5817 N respectively. The speed of the cage is 1 m/s. The pulley has a provision to carry 2 ropes which support the cage and balance weights. Design the pulley and determine the rotational speed of the pulley. **(05)**

5. An IC Engine piston made of aluminium alloy has a diameter of 80 mm. The thickness of the piston head is 10 mm. The stroke length is 150 mm. The maximum explosion pressure is 2.8 MPa. Determine dimensions of the piston head, piston rings and the piston skirt. Design the gudgeon pin based on bearing pressure. **(05)**

6. Design a screw jack to lift a load of 5 tons through a height of 150 mm. The screw rod is made of steel having yield strength of 300 MPa, in tension & compression and yield shear strength of 180 MPa. The nut is made of phosphor bronze having an allowable bearing pressure of 15 MPa. The cup and body are made of cast iron having an ultimate strength of 500 MPa in compression & 250 MPa in tension. Draw the **front view** of the screw jack. **(25)**

OR

Design the connecting rod for a four stroke petrol engine having the specifications:

Indicated power at 1600 rpm = 25 kW

Stroke length = 220 mm

Connecting rod length = 440 mm

Compression ratio = 8:1

Weight of reciprocating parts = 20 N

Mean effective pressure = 1.45 MPa

Maximum explosion pressure = 2.45 MPa.

Weight density of material of connecting rod is 80,000 N / m^3.

The Permissible tensile strength of connecting rod material is 315 MPa. The material for bolt is Mild Steel with ultimate tensile strength of 500 MPa and FOS = 6. Draw the **front view** of assembly showing big and small ends in section.