

COLLEGE OF ENGINEERING PUNE.  
**ENDSEM EXAM 2014-15**  
 BASIC MECHANICAL ENGINEERING, ME-101

27 NOV 2014

Programme :FY BTECH (Electrical group ) Duration: 3hrs

Max Marks: 60

**Instructions:** Answer all questions.

Illustrate your answer with neat sketches.

10.00 am To 1.00 pm

Steam tables and nonprogrammable calculators are allowed

Q1	a	Define the following terms.  i) Point function ii) Path function iii) Quasistatic process iv) Thermodynamic equilibrium	02																
	b	Define thermometric property. Name at least 4 types of thermometers and its corresponding thermometric properties.	02																
	c	A cycle comprises of three processes. The energy transfers in each process are tabulated below:  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Process</th> <th>Q (kJ)</th> <th>W (kJ)</th> <th><math>\Delta U</math></th> </tr> </thead> <tbody> <tr> <td>1-2</td> <td>+50</td> <td>----</td> <td>+20</td> </tr> <tr> <td>2-3</td> <td>----</td> <td>+30</td> <td>-10</td> </tr> <tr> <td>3-1</td> <td>-----</td> <td>----</td> <td>-----</td> </tr> </tbody> </table> <p>If the net work done per cycle is +30 kJ and a system completes 10 cycles/min, Complete the table and find the rate of work in kW.</p>	Process	Q (kJ)	W (kJ)	$\Delta U$	1-2	+50	----	+20	2-3	----	+30	-10	3-1	-----	----	-----	04
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Q2	a	A sample of steam at 5 bar is stated to have an enthalpy of 2350 kJ/kg. Determine the specific volume and internal energy for this sample of steam.  <b>Data from steam tables:</b> At $p=5$ bar, $T_s = 151.8^\circ\text{C}$ , $v_f=0.001093$ m <sup>3</sup> /Kg, $v_g=0.3748$ m <sup>3</sup> /Kg, $h_f=640$ kJ/Kg, $h_{fg}= 2107$ kJ/Kg, $h_g=2749$ kJ/Kg.	02																
	b	Write four differences between hydraulic impulse and reaction turbines.	02																
	c	Sketch and explain the construction and working of a window air conditioner.	04																
Q3	a	Classify heat exchangers. Sketch and explain any one type of regenerator type of Heat exchanger.	02																
	b	Define the term Overall heat transfer coefficient. Write its importance.	02																
	c	A display unit has a window made up of two 5 mm thick transparent plastic sheets separated by a uniform gap of air of thickness 2 mm. Inside air temperature of unit is 20°C and outside atmospheric air is at 30°C. Assuming inside and outside convective heat transfer coefficients as 25 W/m <sup>2</sup> K, determine the rate of heat leakage into the unit per m <sup>2</sup> of window. Neglect convection in air gap. Take $K_{\text{plastic}}= 0.75$ W/m-K, $K_{\text{air}}= 0.023$ W/m-K.	04																
Q4	a	i) Explain the terms i) Viscosity ii) Surface tension  ii) Mention <b>four</b> different types of fluid flows with one example for each.	02 02																
	b	A U-tube manometer is used to measure the pressure of oil of specific gravity 0.85	04																

		flowing in a pipe line. Its left end is connected to the pipe and the right limb is open to the atmosphere. The centre of the pipe is 100 mm below the level of mercury (specific gravity= 13.6) in the right limb. If the difference of mercury level in the two limbs is 160 mm, draw a sketch of this manometer and determine the absolute pressure (in kPa) of the oil in the pipe. Also express this pressure in terms of meters of oil column.	
	c	A converging pipe of 30 cm and 15 cm diameter carrying water is positioned inclined whose inlet and outlet are at 6 m and 1 m above the datum. The pressure at inlet is 1.5 bar and velocity is 5 m/s. Find the pressure of water(in bar) at the outlet of the pipe. Neglect the losses.  <b>[OR]</b>  A tapered pipe 5 m in length is inclined to horizontal by $15^\circ$ and carries water through 10 cm diameter and discharged out through 25 cm diameter. The inlet velocity of water is 1 m/sec. Find out the pressure difference between the inlet and exit in bar.	04
Q5		<b>Answer any three questions.</b>	
	a	Name various types of Gear Drives? With neat sketch explain any three of them along with their applications.	04
	b	What are keys? List the various types. Sketch at least three.	04
	c	Differentiate between Rigid and flexible couplings. With neat sketch explain Universal coupling. Also write its advantages and disadvantages.	04
	d	Compare Flat and V type Belt drives. Explain with sketches, Open and crossed type of belt drives.	04
Q6		<b>Answer any three questions.</b>	
	a	Explain construction and working of fixed dome type biogas plant with neat sketch.	04
	b	Explain construction and working of nuclear reactor power plant with neat sketch.	04
	c	With neat sketch explain construction and working of Solar flat plate collector.	04
	d	Write a short note on Ocean thermal energy conversion (OTEC), with a neat sketch.	04

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