Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

USN | | | | | | | | | | |

Fourth Semester B.E. Degree Examination

Thermodynamics and Fluid Mechanics

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	What do you understand by thermodynamic equilibrium and list the conditions for the thermodynamic equilibrium of the system CO1,PO1	L2	6
	b	Define and Prove Zeroth law of thermodynamics CO1,PO1	L1	6
	c	Differentiate between with examples i) extensive and Intensive properties ii) Reversible and Irreversible process CO1,PO1	L2	8
		OR		
Q.02	a	Prove that work and heat are path function and not properties of the system CO1,PO2	L2	8
	b	Compare heat and work CO1,PO2	L2	6
	c	A gas is compressed from initial volume $0.42m^3$ to $0.12m^3$ according to law p=a+bV , $a = 600$kPa , $b = -1200$kPa/m^3. Calculate the work done during the process CO1,PO2	L3	6
		Module-2		
Q. 03	a	State Kevin Planc and Claussius statement and prove that are both statements are equivalent CO1,P01	L2	10
	b	A system receives 180kJ of heat in a constant volume process followed by a constant process in which it rejects 200kJ of heat and receives 50kJ of work a) if the system is brought back to its original state by an adiabatic process. Determine magnitude and direction of work for third process b) Taking energy at initial state as zero , determine energy at other two states CO1,P01	L3	10
		OR		
Q.04	a	Derive an expression for work done in single stage air compressor CO4,PO1	L2	8
	b	Define and explain the volumetric efficiency in single stage compressor CO4	L1	4
	c	A reciprocating air compressor has 5 percent clearance with a bore of 25cm and length of stroke 30cm. The compressor operates at 500rpm. The air enters the cylinder at 27^oC and 95kPa and discharges at 2000kPa. If n=1.3 for compression and expansion processes. Determine i) the volumetric efficiency ii) the volume of air handled at inlet conditions in m^3/sec iii) the power required iv) the mass of air discharged in kg/s CO4,P01	L3	8
		Module-3		
Q. 05	a	Differentiate between with its units i) Mass density and specific weight ii) Absolute viscosity and Kinematic viscosity iii) surface tension and capillarity CO2	L1	10
	b	An oil film thickness 1.5mm is used for lubrication between a square plate of the size 0.9mx0.9m slides down an inclined plane having an inclination 20^o with the horizontal. The weight of the square plate is 392.4Nm and slides down with a uniform velocity of 0.2m/s . Find the Kinematic viscosity and absolute viscosity	L3	10

		of the oil. Specific gravity of the oil is 0.7 CO2,PO5		
		OR		
Q. 06	a	Explain with neat sketch how the Discharge rate can be measured using venturimeter with formula used based on Burnollis equation CO2,PO4	L2	8
	b	A 20cm -10 cm venturimeter is inserted in horizontal pipeline carrying oil of specific gravity 0.8. The discharge through the venturimeter is 60 litres per sec. Find the reading of oil mercury differential u tube manometer. Take C_d=0.98 C02,P04	L3	12
		Module-4		
Q. 07	a	Derive an expression for total pressure and centre of pressure for a immersed vertical plane plate in a static fluid CO2,PO5	L2	10
	b	A circular plate of diameter 3m is submerged in water. Its greatest and least depths below the water surface are 2m and 1m respectively. Find the total pressure on the plate and position of the centre of pressure CO2,PO5	L3	10
		OR		
Q. 08	a	Define Meta centric height in a floating body and derive an expression to calculate the meta centric height CO2,PO5	L1,L2	10
	b	A rectangle pontoon 5m long , 3m wide and 1.2 m height. The depth of immersion of pontoon is 0.8m in a sea water. If the center of gravity is 0.6m above the bottom of the pontoon, determine the meta centric height. Take density of sea water is 1025kg/m^3 CO2,P05	L3	10
		Module-5		
Q. 09	a	Derive an expression for Euler's equation and further derive an Buronolli's equation CO2,PO5	L2	10
	b	A pipe carrying oil of specific gravity 0.87 changes in diameter from 200mm at a position A to 500mm at a position B which is 4m higher than position A. If the pressure at level A and B are 9.81N/cm^2 and 5.886N/cm^2 respectively and discharge is 200lit/s. Determine the loss of head and direction of flow. C02,PO4	L3	10
		OR		
Q. 10	a	Explain clearly hydraulic gradient and total Energy line with neat sketch and equations CO3,P04	L2	8
	b	Water is flowing through a horizontal pipe of 30cm diameter and 40m length. While one end of the pipe is connected to a tank, the other end is open to the atmosphere. If the height water in the tank is 5m above the centre of pipe, determine the rate of flow of through the pipe . Also draw the energy gradient line and hydraulic gradient line. The Darcys friction factor f=0.02 CO3,P04	L3	12