

A**Reg. No. :**

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Question Paper Code: R4702

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2025

Fourth Semester

Mechanical Engineering

R21UME402 - APPLIED THERMAL ENGINEERING

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1.	Constant pressure cycle is				CO1- U
	(a) Otto cycle	(b) Dual cycle	(a) Otto cycle	(b) Dual cycle	
2.	Limited pressure cycle is				CO1- U
	(a) Otto cycle	(b) Dual cycle	(c) Diesel cycle	(d) Brayton cycle	
3.	Function of carburetor is				CO1- U
	(a) To mix diesel with air		(b) To mix diesel with petrol		
	(c) To mix petrol with air		(d) none of this		
4.	In a diesel engine, the duration between the time of injection and ignition, is known as				CO1- U
	(a) pre-ignition period		(b) delay period		
	(c) period of ignition		(d) burning period		
5.	The steam governor is used to				CO1- U
	(a) Store energy	(b) Convert energy	(c) Maintain speed	(d) Balancing weight	
6.	Thermal equilibrium means that the flow of steam is				CO1- U
	(a) isothermal	(b) isentropic	(c) hyperbolic	(d) polytropic	
7.	Positive displacement compressor				CO1- U
	(a) Centrifugal compressor		(b) Axial compressor		
	(c) Reciprocating compressor		(d) Roots blower		

8.	The volumetric efficiency for reciprocating air compressors is about				CO1- U	
	(a) 10 to 40%	(b) 40 to 60%	(c) 60 to 70%	(d) 70 to 90%		
9.	The humidity ratio or specific humidity is the mass of water vapor present in				CO1- U	
	(a) 1 m ³ of wet air		(b) 1 kg of wet air			
	(c) 1 kg of dry air		(d) above all			
10.	A vapour absorption refrigerator uses _____ as a refrigerant.				CO1- U	
	(a) water	(b) ammonia	(c) Freon	(d) aqua-ammonia		
PART – B (5 x 2= 10 Marks)						
11.	Illustrate the assumption made in deriving the air-standard efficiency of Carnot engine.				CO1- U	
12.	Classify the I.C. engines based on combustion				CO1- U	
13.	Explain stagnation enthalpy				CO1- U	
14.	Explain the advantage of multistage compressor over single stage compressor.				CO1- U	
15.	Compare absolute humidity and relative humidity.				CO1- U	
PART – C (5 x 16= 80 Marks)						
16.	(a)	<p>The compression ratio for a single-cylinder engine operating on dual cycle is 9. The maximum pressure in the cylinder is limited to 60 bar. The pressure and temperature of the air at the beginning of the cycle is 1 bar and 30o C. heat is added during constant pressure process up to 4 percent of the stroke. Assuming the cylinder diameter and stroke length as 250 and 300 mm respectively, Calculate :</p> <p>The air standard efficiency of the cycle.</p> <p>The power developed is the number of working cycles is 3 per second</p> <p>Take for air $C_v = 0.71$ kJ/kg K and $C_p = 1.0$ kJ/kg K.</p>			CO2- App	(16)
		Or				
	(b)	<p>An Engine working on an ideal air standard diesel cycle has the compression ratio as 15 and heat transfer as 1400 kJ/kg. Find the pressure and temperature at the end of the each processes if the Intet conditions are 280K and 1.1 bar. Also find the air standard efficiency and mean effective pressure</p>			CO2- App	(16)

17.	(a)	Explain the working of Simple carburetor with neat sketch.	CO1- U	(16)
		Or		
	(b)	Explain the types of cooling system employed in IC Engine in details.	CO1- U	(16)
18.	(a)	Dry saturated steam enters a steam nozzle at a pressure of 12 bar and is discharged to a pressure of 1.5 bar. If the dryness fraction of a discharged steam is 0.95, what will be the final velocity of steam? Neglect initial velocity of steam.	CO2- App	(16)
		Or		
	(b)	A constant pressure open cycle gas turbine plant works between temperature range of 15 ⁰ C and 700 ⁰ C and pressure ratio of 6.find the mass of air circulating in the installation, if it develops 1100kW.also find the heat supplied by heating chamber.	CO1- U	(16)
19.	(a)	A single acting reciprocating air compressor has cylinder diameter and stroke of 200mm and 300mm respectively. The compressor sucks air at 1 bar and 270 ⁰ C and delivers at 8 bar while running at 100 rpm. Find (i) Indicated power of the compressor (ii) Mass of air delivered by the compressor per min. (iii) Temperature of the air delivered by the compressor. The compression follows the law $PV^{1.25} = C$.	CO3- App	(16)
		Or		
	(b)	A single stage steam turbines is supplied with a steam at a bar, 200 ⁰ C at the rate of 50 kg/min. it expands in to a condenser at a pressure of 0.2 bar. The blade speed is 400m/s. the nozzles are inclined at an angle of 20° to the plane of the wheel and the outlet blade angle is 30°. Neglecting frictional losses, determine the power developed, blade efficiency and stage efficiency.	CO3- App	(16)
20.	(a)	Explain the construction and working of Ammonia-water vapour absorption refrigeration system.	CO1- U	(16)
		Or		
	(b)	Explain the Concepts of RSHF, GSHF, ESHF.	CO1- U	(16)

