Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2017)

Fifth Semester

MECHANICAL ENGINEERING

U17MEI5201: Thermal Engineering

COURSE OUTCOMES

CO1: Explain the working principle and combustion characteristics of IC Engines.
CO2: Calculate the performance parameters of Gas power cycles, IC Engines and estimate the fuel properties
CO3: Explain the performance characteristics of steam nozzles.
CO4: Discuss the importance of velocity diagrams and compounding in Turbines
CO5: Calculate the various efficiencies of the air compressors.
CO6: Explain the working principle of VCR & VAR systems.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	What is the function of camshaft in 4 stroke diesel engines?	CO1	[K_2]
2.	Define Cetane number of a fuel.	CO1	[K_1]
3.	Name the factors that affect the air standard efficiency of diesel cycle.	CO2	[K_2]
4.	Define the term cutoff ratio.	CO2	[K_1]
5.	Define critical pressure ratio.	CO3	[K_1]
6.	What is the effect of friction in the nozzle dryness fraction of steam?	CO4	[K_2]
7.	What is meant by free air delivered by a compressor?	CO5	[K_2]
8.	What are the factors that affect the volumetric efficiency of a reciprocating compressor?	CO5	[K_2]
9.	Define RSHF.	CO6	[K_1]
10.	Define Degree of saturation.	CO6	[K_1]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	With the help of a neat sketch explain the working of two stroke SI Engine	8	CO1	[K_2]
	b)	Explain the working of pump circulation engine cooling system with neat sketch.	8	CO1	[K_2]
12.		In a Brayton cycle, the air enters the compressor at 1bar and 25℃. The pressure of air leaving the compressor is 3 bar and temperature at turbine inlet is 650℃. Determine per kg of air (i) Cycle efficiency (ii) Heat supplied to air (iii) Work input (iv) Heat rejected in the cooler and (v) Temperature of air leaving the turbine.	16	CO2	[K_3]
13.		The flow rate through steam nozzle with isentropic flow from a pressure of 13 bar was found to be 60kg/min. Steam is initially saturated. Determine the throat area. If the flow is super saturated, determine the increase in the flow rate.	16	CO3	[K_3]
14.		Steam enters the blade row of an impulse turbine with a velocity of 600 m/s at an angle of 25℃ to the plane of rotation of the blades. The mean blade speed is 250 m/s. The blade angle at the exit side is 30 degree. The blade friction loss is 10%. Determine (i) The blade angle at inlet, (ii) The work done per kg of steam (iii) The diagram efficiency (iv) The axial thrust per kg of steam per second.	16	CO4	[K_3]
15.		A single stage reciprocating compressor receives air at 25 m^3/ min at 1 bar, 15℃ and discharges it at 15 bar. Assume the value of n for compression as 1.35 and volumetric efficiency as 0.75.Determine (i) Theoretical power required (ii) Piston displacement per min (iii) Maximum air temperature.	16	CO5	[K_3]
16.		The air handling unit of an air conditioning plant supplies a total of 4500 m^3/min of dry air which comprises by weight 20% fresh air at 40℃ DBT and 27 ℃ WBT and 80% recirculated air at 25 ℃ DBT and 50 % RH. The air leaves the cooling coil at 13 ℃ saturated state . Calculate the total cooling load and room heat gain.	16	CO6	[K_3]

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