T.Y. Diploma : Sem. V

[ME/AE]

Power Engineering

Time : 3 Hrs.] Prelim Question Paper **[Marks : 100**

Instruction : (1) All Questions are compulsory.
(2) Answer each next main Question on a new page.
(3) Illustrate your answer with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

1. (a) Attempt any **THREE** of the following: **[12]**

(i) Represent 'Brayton Cycle' on P-V and T-S diagram.

(ii) A two stage air compressor with perfect intercooling takes in air at 1 bar pressure and 27°C. The law of compression in both the stages is $Pv^{1.3}$ = constant. The compressed air is delivered at 9 bar from the H.P. Cylinder to an air receiver. Calculate per kg. of air
(1) The minimum work done.
(2) The heat rejected to the intercooler.

(iii) Classify gas turbines (any four).

(iv) Enlist different uses of compressed air.

(b) Attempt any **ONE** of the following: **[6]**

(i) Explain regeneration method to improve thermal efficiency of gas turbine with the help of flow diagram and T-S diagram.

(ii) A four cylinder engine running at 1200 rpm delivers 20 kW. The average torque when one cylinder was cut is 110 N.m. Find the indicated thermal efficiency if the calorific value of the fuel is 43 MJ/Kg and the engine uses 360 gm of gasoline (fuel) per kW.hr.

2. Attempt any **TWO** of the following: **[16]**

(a) Reciprocating air compressor draws 6 kg of air per minute at 25°C. It compresses the air polytropically and delivers it at 105°C. Find the work done by the compressor and air power. Also find mechanical efficiency if shaft power is 14 kW. Assumer R = 0.287 kJ/kg°K and n = 1.3.

(b) Differentiate between reciprocating air compressor and rotary air compressor.

(c) Following observations were made during a trial on 4-stroke, single cylinder engine running at 240 rpm having brake wheel diameter 1.5 meter.

Duration of trial	30 min.
Fuel consumption	6 liter
C.V. of fuel	42000 kJ/kg
Sp. gravity	0.8
IMEP	550 kPa
Brake load	150 kg
Spring balance reading	15 kg
Cylinder diameter	30 cm
Stroke length	45 cm
Jacket cooling water	11 kg/min
Temp. rise in jacket water	36°C

Determine :

(i) I.P. and B.P. (ii) Heat balance sheet on percentage basis.

3. Attempt any **FOUR** of the following: **[16]**

(a) State the norms of Bharat Stage III and IV.

(b) Define : (i) Humidity ratio (ii) Specific humidity

(c) Explain MPFI with neat sketch.

(d) What is 'Scavenging'? List any two types of 'scavenging'.

(e) Explain the effect of superheating and subcooling on the performance of vapour compression cycle.

4. (a) Attempt any **THREE** of the following: **[12]**

(i) Explain w.r.to dual cycle

(1) cutoff ratio (2) pressure ratio

(ii) State any four effect of detonation.

(iii) Name the refrigerants used for :

(1) Water cooler (2) Domestic refrigerator

(3) Ice plant (4) Cold storage

(iv) Explain the process of combustion in diesel engine.

(b) Attempt any **ONE** of the following: **[6]**

(i) Name any four additives used in lubricants? State their advantages.

(ii) What is meant by catalytic converter? Briefly explain with the help of neat sketch.

5. Attempt any **TWO** of the following: **[16]**

(a) State the methods used to improve thermal efficiency of gas turbine and explain any one.

(b) What do you mean by 'Perfect Intercooling"? Explain with the help of P.V. diagram.

(c) List out different pollutants in exhaust gases of petrol and diesel engine? Briefly explain their effects on human beings and environments (at least four).

6. Attempt any **FOUR** of the following: **[16]**

(a) Explain the following terms :

(i) Daltons law of partial pressures (ii) Relative humidity

(b) Draw the schematic diagram of turbojet engine.

(c) Compare between window air conditioner and split air conditioner (any four).

(d) Draw neat sketch of split air conditioner and name the parts.

(e) Explain any one method to improve thermal efficiency of gas turbine with the help of block diagram.

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T Y Diploma Sem-V: Paper Discussion Schedule

Branches	Date	Day	Timing	Centres
Mechanical Group	8 Nov. 2018	Thursday	9 a.m. to 11 a.m.	Dadar, Kalyan
	8 Nov. 2018	Thursday	12 noon to 2 p.m.	Thane