MECHANICAL ENGINEERING DEPARTMENT, GMIT, BHAVNAGAR.

QUESTION BANK

SUBJECT CODE:**2110006**

SUBJECT: **ELEMENTS OF MECHANICAL ENGINEERING**

Sr. No.	Detail	GTU Year	Marks
	INTRODUCTION		
1.	What is Prime mover? How are they classified?	June - 2009 + Sept. 2009	03
2.	State and explain Zeroth law of Thermodynamics.	June - 2009 + Dec 2011	04
3.	Define zeroth law of thermodynamics, and First law of thermodynamics.	Sept. 2009	04
4.	State and explain first law of thermodynamics.	Jan - 2010	04
5.	Define the following terms: (i) Prime mover (ii) Specific heat (iii) Internal energy	June - 2010	03
6.	Give the statements of zeroth law, first law and second law of thermodynamics	June - 2010	03
7.	Define the following terms: Prime mover, Boundary, Latent Heat, Temperature,First law of thermodynamics	Dec - 2010	05
8.	An artificial satellite has a mass of 600 Kg and is moving towards moon. Calculateits kinetic and potential energies in (MJ) relative to earth when it is 50 Km fromlaunching and moving at 2500 Km/hr. Take acceleration of earth's gravitationalfield as 790 cm/s2	Dec - 2010	05
9.	How prime movers are classified? Explain different sources of energy used by them	Jan 2011	07
10.	Classify thermodynamic system and give example of each.	July - 2011	03
11.	Write similarities between heat transfer and work transfer.	July - 2011	04
12.	Define Pressure and explain Absolute Pressure, Gauge Pressure andAtmospheric pressure	June 2013	04
13.	Explain Specific heat. Give Statements of Zeroth Law and First law of thermodynamics.	June 2014	04
	ENERGY		
1.	Write short notes on CNG	June - 2009	03
2.	State the advantages of gaseous fuels over solid and liquid fuels.	Jan - 2010	04
3.	What do you mean by non-conventional energy sources? How does it differfrom conventional sources?	Jan - 2010	03

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4.	Give detailed classification of fuel. Write short note on wind energy	Dec 2013	07
5.	Write a short-note on bio-fuels.	June 2014	03
	PROPERTIES OF GASES		
1.	With usual notations prove that Cp – Cv = R.	June – 2009 + Dec 2014	04
2.	A gas whose pressure, volume, and temperatures are 2.75 bar, 0.09m3 and 185°C respectively has the state changed at constant pressure until its temperature becomes15°C. Calculate (i) Heat Transferred. (ii) Work Done during the process. Take R= 0.29 KJ/Kg K , and Cp = 1.005 KJ/Kg K.	June - 2009	07
3.	In air compressor air enters at 1.013 bar and 27 degree centigrade having volume 5.0 m3/kg and it is compressed to 12 bar isothermally. Determine (i) Work done (ii) Heat transfer and (iii) Change in internal energy.	Sept. 2009	07
4.	An ideal gas is heated from 25ºC to145ºC. The mass of gas is 2 kg. Determine (i) Specific heats (ii) change in internal energy, (iii) change inenthalpy. Assume R = 267 J/Kg K and γ =1.4 for the gas.	Jan - 2010	07
5.	Sate the following Charles Law, Boyles Law, Characteristic gas equation	April - 2010	03
6.	A cylindrical vessel of 1 m diameter and 4 m length has hydrogen gas atpressure of 100 k Pa and 27° C. Determine the amount of heat to be supplied soas to increase pressure to 125 k Pa. for hydrogen takeCp= 14.307 k J/ Kg K , Cv=10.183 k J/ Kg K	April - 2010	07
7.	What is isothermal process? Derive an expression for the work done duringthe isothermal process	June - 2010	05
8.	Determine the work done in compressing one kg of air from a volume of0.15m3 at a pressure of 1.0 bar to a volume of 0.05 m,3 when the compressionis (i) isothermal and (ii)adiabatic, Take γ =1.4 Also, comment on your answer.	June - 2010	06
9.	One Kg of gas at 100 kN/ m2 and 17° C is compressed isothermally to a pressure of2500 kN/ m2 in a cylinder. The characteristic equation of the gas is given by theequation PV = 260 T / Kg where T is in degree Kelvin. Find out(i) The final temperature ii) Final Volume iii) compression ratioiv) change in enthalpy v) work done on the gas.	Dec - 2010	06
10.	Prove that PV^{γ} =C, for an adiabatic process.	Dec - 2010	04
11.	Define adiabatic process. Derive the relation between P, V and T for this process. Alsoderive the expression for work done and change in internal energy for this process.	Jan 2011	07
12.	For adiabatic process derive PV^{γ} = constant.	July - 2011	04

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13.	One kg of gas is compressed polytropically from 150 KPa pressure and 290K temperature to 750 KPa. The compression is according to law $PV^{1.3}$ =constant. Find :(a) final temperature (b) work-done (c) change in internal energy (d)amount of heat transfer and (e) change in enthalpy. Take R = 0.287KJ/kgK and Cp = 1.001 KJ/kgK.	July 2011	07
14.	What is flow and non-flow process?	Dec 2011	03
15.	What is adiabatic process? Prove with usual notations the law of governing adiabatic 7process process as PV^{γ} = Constant.	Dec 2011	07
16.	0.67 kg of gas at 14 bar and 290 ºC is expanded to four times the original volume according 7to the law PV1.3 = Constant. Caluculate : (1) The original and final volume of the gas. (2) The final temperature of the gas . (3) The final pressure of the gas. Take R = 287 J/kgK.	Dec 2011	07
17.	$0.3m^3$ of air of mass 1 kg at an initial pressure of 5.5 bar expands toa final volume of 0.5m3 If the expansion is according to the law pv1.3= C, Find the work done, the change in internal energy and heatreceived or rejected during the process.Take Cv = 0.708 kJ/kg K and R = 0.287 kJ/kg K for air.	May 2012	07
18.	Explain Isothermal Process. For Isothermal process. Find expression of work done,Change in Internal Energy, Change in Enthalpy and Heat transfer.	Jan 2013	07
19.	Derive Expression PV/T=constant with the help of Boyle's law and Charle's law.	June 2013	05
20.	A steel cylinder contains O_2 at pressure of 25 bar and temperature of 270C,After using some quantity of the gas the pressure was found to be 5 barand temperature of 200C.700 liters of O_2 was originally put in the cylinderat NTP Density of O2 at NTP is 1.43 gm/liter. Find the mass of O_2 used.	June 2013	06
21.	What is an adiabatic process? For adiabatic process with the usual notation provePV^{γ} = constant.	Dec 2013	07
22.	1 kg of air at 9 bar pressure and 80o C temperature undergoes a non-flow work polytropic process. The law of expansion is $PV^{1.1}$ = C. The pressure falls to 1.4 bar during process. Calculate (1) Final temperature (2) Work done (3) Change in internal energy (4) Heat exchange. Take R=287 J/kg and γ = 1.4 for air.	June 2014	07
23.	State & Explain Charles's law.	June 2014	03
24.	Prove the equation of work done for Isothermal process.	June 2014	04
25.	Determine the work done in compressing one kg of air from a volume of 0.15m3 at a pressure of 1 bar to a volume of 0.05 m3, when the compression is 1) adiabatic 2) isothermal. Take γ = 1.4. Give your comments.	June 2015	07
PROPERTIES OF STEAM			
1.	Prove that dryness fraction + wetness fraction = 1.	June - 2009	04

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2.	Determine condition of steam at a 12 bar if 2580 KJ/kg heat is required to produce it from water at 0 degree centigrade.	Sept. 2009	04
3.	The following information is available from test of a combined separating and throttling calorimeter. (i) Pressure of steam in a steam main = 9.0 bar. (ii) Pressure after throttling = 1.0 bar. (iii) Temperature after throttling =115 degree centigrade. (iv) Mass of steam condensed after throttling = 1.8 Kg (v) Mass of water collected in the separator = 0.2 Kg.Calculate the dryness fraction of the steam in the main.	Sept. 2009	07
4.	What is dryness fraction? Explain throttling calorimeter.	Jan - 2010	03
5.	Determine dryness fraction of steam supplied to a separating and throttlingcalorimeter. Water separated in separating calorimeter = 0.45 kg Steam discharge from throttling calorimeter = 7 kg Steam pressure in main pipe = 1.2 MPa Barometer reading = 760 mm of Hg Manometer reading = 180 mm of Hg Temperature of steam after throttling = 140º C Take Cps = 2.1 kJ/kg K.	Jan - 2010	07
6.	With neat sketch explain construction and working of throttling calorimeter	April -2010 + Dec - 2010	04
7.	Define the following terms: (i) Dryness fraction of steam (ii) Degree of superheat	June - 2010	02
8.	Determine the enthalpy and internal energy of 1 Kg of steam at a pressure 10bar(abs.), (i)when the dryness fraction of the steam is 0.85 (ii) when thesteam is dry and saturated (iii) when the steam is superheated to300ºC.Neglect the volume of water and take the specific heat of superheated steamas 2.1 KJ/KgK.	June - 2010	07
9.	What amount of heat would be required to produce 5 kg of steam at a pressure of5 bar and temperature of 250 °C from water at 30° C, take Cps=2.1KJ/Kg K.	Dec - 2010	06
10.	What is a superheated steam? How much heat is added to convert 3 kg of water at 30 ^{o}Cinto steam at 8 bar and 210 ^{o}C ? Take specific heat of superheated steam as 2.1 kJ/kg-Kand that of water as 4.186 kJ/kg-K	Jan 2011	07
11.	Dry saturated steam at 7 bar pressure is expanded to 1 bar following the law$PV^{1.1}$=constant. Determine (i) work-done (ii) change in internal energy(iii) heat transferred during the process.	July 2011	07
12.	Define : Latent Heat , Degree of superheat , Enthalpy of evaporation	July 2011	03
13.	Define : (i) Sensible heat (ii) Enthalpy of evaporation 4 (iii) Heat of superheat (iv) Dryness Faction.	Dec 2011	04
14.	Calculate the enthalpy per kg of steam at 10 bar pressure and a temperature of 300 ºC. 7Find also the change in enthalpy if this	Dec 2011	07

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	steam is expanded to 1.4 bar and dryness fractionof 0.8. Take specific heat of superheat steam equal to 2.29 kj/kgK.		
15.	What are basic gas processes? How are they shown graphically on p-v diagram?	May 2012	03
16.	How much heat is needed to convert 4 kg of water at 200C intosteam at 8 bar and 2000C. Take Cp of superheated steam as 2.1 kJ/kg K and specific heat of water as 4.187 kJ/kg K.	May 2012	04
17.	Define the following terms: (a)Wet steam (b) Degree of superheat (c) Saturation temperature	May 2012	03
18.	What do you mean by Dryness fraction? Describe Combinedcalorimeter with a neat sketch.	May 2012	07
19.	Calculate the heat required to form 2.5 kg dry steam at 1.1 MPa from water at20^{o}C. Determine the amount of heat removed at constant pressure to cause thesteam to become 0.95 dry. Calculate the specific volume at respective condition.	Jan 2013	07
20.	Define : (i) Sensible heat (ii) Latent heat (iii)Dryness fraction (iv) Enthalpy of evaporation.	June 2013	04
21.	Explain Separating Calorimeter with neat sketch.	June 2013	05
22.	Find internal energy of 1 kg of steam at a pressure of 15 bar when (i) The steam is superheated with temperature of 4000C. (ii) The steam is wet with dryness fraction =0.9 Take Cps=2.1 kJ/kg K	June 2013	05
23.	Determine enthalpy and internal energy of 1 kg of steam at a pressure of 12 barwhen (i) the dryness fraction of steam is 0.8 (ii) steam is dry and saturated(iii) steam is superheated to 2800 C. Take Cps = 2.1 kJ/kg K.	Dec 2013	07
24.	What is throttling process? Explain throttling calorimeter with neat sketch. Deriveequation for dryness fraction.	Dec 2013	07
25.	Calculate the internal energy per kg of superheated steam at 10 bar and a temperature of 3000C. Find also change in internal energy if this steam is expanded to 1.4 bar and dryness fraction 0.8.	June 2014	07
26.	Write a short note on Separating calorimeter with its limitations.	June 2014	07
27.	1.5 kg of steam at a pressure of 10 bar and temperature of 2500C is expanded until the pressure becomes 2.8 bar. The dryness fraction of steam is then 0.9. Calculate change in internal energy.	Dec 2014	07
28.	List methods of measuring dryness fraction. Explain any one of them.	June 2015	07
29.	Explain water Temperature- Enthalpy Diagram for water.	June 2015	07
30.	What amount of heat is required to produce 5 kg of steam at a pressure of 5 bar and temperature of 250°C from water at 30°C, take Cps =2.1kJ/kg K	June 2015	07
HEAT ENGINES			
1.	Explain the essential elements of a Heat Engine.	June - 2009	03

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2.	Show that the efficiency of Otto cycle is a function of Compression Ratio only.	June – 2009 + July 2011	04
3.	In air standard Otto Cycle the Maximum and Minimum temperatures are 1673 K and 288 K. The heat supplied per Kg of air is 800 KJ. Calculate. (i) The Compression Ratio. (ii) Efficiency. (iii) Max & Min Pressures. Take Cv = 0.718 KJ/Kg K & γ = 1.4 for air.	June - 2009	07
4.	Derive an expression for efficiency of Otto cycle.	Sept. 2009 + Dec 2011 + Dec 2014	03
5.	A hot air engine works on Carnot cycle with thermal efficiency of 70%. If final temperature of air is 20 degree centigrade, determine initial temp.	Sept. 2009	04
6.	Derive thermal efficiency formulae for Rankine cycle.	Jan - 2010	04
7.	Define heat engine. What are the essential requirements of heat engine?	Jan – 2010	03
8.	Determine the compression ratio, the cycle efficiency, and the ratio ofmaximum to minimum pressure in an air standard Otto cycle fromfollowing data : Minimum temperature = 25º C Maximum temperature = 1500º C Heat supplied per kg of air = 900 kJ Take Cv = 0.718 kJ/kg K & γ = 1.4	Jan – 2010	07
9.	In an Otto Cycle, air at 15 ° C and 1 bar is compressed adiabatically until thepressure is 15 bar. Heat is added at constant volume until pressure rises to 40bar. Calculate (i) Air standard efficiency (ii) compression ratio and (iii) meaneffective pressure for cycleAssume Cv= 0.718 k J/ Kg KR= 8.134 k J/ k mole K	April - 2010	07
10.	0.15m3 of air at pressure of 900 kPa and 300 ° C is expanded at constantpressure to 3 times its initial volume. It is expanded polytropically following thelaw PV1.5 =C and finally compressed back to initial state isothermally.Calculate heat received, heat rejected, efficiency of cycle.	April - 2010	07
11.	For the same compression ratio the air standard efficiency of Otto cycle isgreater than that of Diesel cycle.' Justify the statement.	June - 2010	02
12.	Prove that efficiency of Carnot Engine working between temperature limits T1 andT2 is given by the expression $\eta = \frac{T_1 - T_2}{T_1}$	Dec – 2010 + July 2011 + June 2013	05
13.	An air standard diesel cycle has compression ratio of 16. The pressure andtemperature at the beginning of compression stroke is 1 bar and 20 °C. Themaximum temperature is 1431 °C. Determine the thermal efficiency and meaneffective pressure for this cycle.	Dec - 2010	05
14.	Explain working of Rankine cycle with P-V diagram. Derive the formula for efficiency ofRankine cycle.	Jan 2011 + June 2015	07

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15.	Air at 150 C and 1 bar is compressed adiabatically to 15 bar by an engineworking on Otto cycle. The maximum pressure of the cycle is 40 bar.Calculate (a) air standard efficiency and (b) mean effective pressure. TakeCv = 0.718 kJ/kgK and R = 8.314 kJ/Kmol K	July 2011	07
16.	In an ideal constant volume cycle the pressure and temperature at the beginning of thecomperession are 97 kPa and 50 ºC respectively. The volume ratio is 5. The heat supplied 7during the cycle is 930 kj/kg of working fluid. Calculate : (1) The maximum temperature attained in the cycle. (2) The thermal efficiency of the cycle. (3) Work done during the cycle/kg of working fluide.	Dec 2011	07
17.	The efficiency of an Otto cycle depends upon its compression ratioproveit.	May 2012	03
18.	In air standard Otto cycle the maximum and minimum temperaturesare 1673 K and 288 K. The heat supplied per kg of air is 800 kJ.Calculate : (1) the compression ratio (2) Efficiency (3) Maximum and minimum pressures. Take Cv = 0.718 kJ/kg K and = 1.4	May 2012	07
19.	Calculate the heat required to form 2.5 kg dry steam at 1.1 MPa from water at20^{o}C. Determine the amount of heat removed at constant pressure to cause thesteam to become 0.95 dry. Calculate the specific volume at respective condition.	Jan 2013	07
20.	An Otto cycle having compression ratio 8 has pressure and temperature at thebeginning of compression are 1 bar and 270C respectively. If heat transfer per cycleis 1900KJ/Kg, find pressure and temperature at the end of each process. TakeCV=0.718 KJ/Kg-K.	Jan 2013	07
21.	An air at 150 C and 1 bar is compressed adiabatically to 15 bar by an engineworking on Otto cycle. The maximum pressure of the cycle is 40 bar. Calculate airstandard efficiency, mean effective pressure. Take Cv = 0.718 kJ/kg K and R =0.287 kJ/kg K.	Dec 2013	07
22.	An engine operates on the air standard diesel cycle. The conditions at the start of the compression stroke are 353 K and 100 kPa , while at the end of compression stroke the pressure is 4 MPa. The energy absorbed is 700 kJ/kg of air. Calculate (1) the compression ratio (2) the cut-off ratio (3) the work done per kg air (4) the thermal efficiency.	June 2014	07
23.	Compare Rankine cycle with Carnot cycle.	Dec 2014	03
24.	In an Otto cycle the compression ratio is 10. The temperature at the beginning of compression and at the end of heat supply is 300 K and 1600 K respectively. Assume, γ = 1.4 and Cv= 0.717 KJ/KgK. Find: (i) Heat supplied (ii) Efficiency of the cycle.	Dec 2014	04
25.	An engine working on ideal Otto cycle has a clearance volume of 0.03m3 and swept volume of 0.12m^{3}. The temperature and pressure at the beginning of compression are 100°C and 1 bar respectively. If the pressure at the end of heat addition is 25 bar,	June 2015	07

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	calculate i) ideal efficiency of the cycle. ii) Temperature at key points of the cycle. Take γ = 1.4 for air.		
	STEAM BOILERS		
1.	Define the following terms in connection with boiler. (i) Mountings. (ii) Actual Evaporation. (iii) Boiler Efficiency.	June - 2009	03
2.	Explain with neat sketch the constructional details and working of the Rams bottom type spring loaded Safety Valve.	June - 2009	04
3.	A Steam Generator evaporates 18000 Kg/Hr of steam at 12 bar Pressure and steam is 97% dry. Feed water temperature = 105 °C. Coal is fired at the rate of 2050 Kg/Hr.C.V. of Coal is 27400 KJ/Kg. Calculate. (i) Heat Supplied per Hour. (ii) Thermal Efficiency. (iii) Actual Evaporation.	June - 2009	07
4.	Differentiate between Fire tube and Water tube boiler.	Sept. 2009 + May 2012 +	03
5.	Enlist different mountings. Explain any one with figure	Sept. 2009	04
6.	A boiler generates 7.5 Kg of steam per Kg of coal burnt at a pressure of 11 bar. The feed water temperature is 70 degree centigrade; boiler efficiency is 75 %,factor of evaporation 1.15. Take Cp = 2.1 KJ/Kg K. Calculate (i) Degree of super heat and temp of steam generated. (ii) Calorific value of coal KJ/Kg (iii) Equivalent evaporation in Kg of steam per Kg of coal.	Sept. 2009	07
7.	Explain Green's economizer with neat sketch.	Sept. 2009	06
8.	Discuss construction and working of Cochran boiler with sketch.	Sept. 2009 + Dec 2011 + Dec 2014	04/07
9.	Differentiate between (i) natural circulation and forced circulation in boiler(ii) internally and externally fired boilers	Jan – 2010	04
10.	Explain very briefly the function of following mountings : (i) Steam stop valve (ii) Feed check valve (iii) Blow-off cock (iv) Waterlevel indicator (v) Pressure gauge (vi) Safety valve.	Jan – 2010	03
11.	A steam generator evaporates 17000 kg/hr of steam at 14 bar and quality of0.95 from feed water at 102º C. When coal is fired at the rate of 2050 kg/hrhaving calorific value 27400 kJ/kg. Assume specific heat of water as 4.187kJ/kg K. Calculate (i) Heat supplied per hour (ii) Thermal efficiency (iii)Equivalent evaporation.	Jan – 2010	07
12.	Write short note on Babcock and Wilcox boiler	Jan – 2010	03
13.	With neat sketch explain construction and working of pressure gauge.	April - 2010	03
14.	What are high pressure boilers? State their advantages and	April - 2010	04

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	disadvantages of highpressure boilers.		
15.	Draw neat and labeled diagram of following (i) Cochran boiler (ii) Fusible Plug	April - 2010	03
16.	A steam generator evaporates 1800 kg / hr of steam at 12 bar pressure and steamis 97 % dry. Feed water temperature is 105 °C coal is fired at rate of 2050 kg/hrCV of coal is 27,400 KJ/ kg. Calculate heat supplied / hr, Thermal efficiency,Equivalent evaporation.	April - 2010	07
17.	State the advantages of high pressure boilers	June – 2010 + Dec - 2010	03
18.	A boiler has equivalent evaporation of 10 Kg per Kg of coal at designcondition. The coal is supplied at the rate of 400 Kg per hour to the boiler.The calorific value of the coal is 34 MJ/Kg. Calculate the thermal efficiencyof the boiler.	June – 2010	04
19.	Explain with neat sketch the construction and working of Babcock andWilcox boiler.	June – 2010	07
20.	Draw neat and labeled sketches of following i) Economizer ii) Babcock Wilcox Boiler	Dec - 2010	04
21.	Explain with neat sketch construction and working of a Cochran boiler.	Jan 2011 + June 2014	07
22.	Explain with neat sketch Bourdon tube type pressure gauge.	July 2011	04
23.	A boiler produces 5500 kg of steam per hour at 1 bar pressure with drynessfraction of 0.94 from feed water at 400 C. The coal supply rate is 600kg/hr.Determine equivalent evaporation in kg of steam / kg of coal burnt andthermal efficiency of boiler if calorific value of coal is 32000 kJ/kg.	July 2011	07
24.	State the function of the following : (1) Pressure gauge (2) Fusible plug (3) superheater	Dec 2011	03
25.	Explain construction and working of Lancashire boiler.	May 2012	07
26.	List out Boiler mountings	Jan 2013	03
27.	Explain fusible plug with neat sketch	Jan 2013 + June 2014	04
28.	What is the main difference between water tube and fire tube boiler? Explain anyone water tube boiler with neat sketch.	Jan 2013	07
29.	Explain construction and working of Locomotive boiler with neat sketch.	June 2013	07
30.	State the function of the following (1) Fusible plug. (2) Economizer (3) Safety valve	June 2013	03
31.	Differentiate between fire tube and water tube boiler. Explain Babcock and Wilcoxboiler construction with neat sketch.	Dec 2013	07
32.	Explain economizer and air-preheater with neat sketch.	Dec 2013	07

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33.	Show the function and location of the following in the boiler plant: (i) Economiser (ii) Steam stop valve (iii) Fusible plug.	Dec 2014	03
	INTERNAL COMBUSTION ENGINES		
1.	Define the following terms : (i) Indicated thermal efficiency. (ii) Compression ratio. (iii) Scavenging.	June - 2009	03
2.	The following readings were taken during the test on a single cylinder four stroke, Oil engine : Cylinder diameter = 270 mm Stroke Length = 380 mm Mean effective pressure = 6 bar Engine Speed = 250 rpm Net load on brake = 1000 N Effective mean Diameter of brake = 1.5 m Fuel used = 10 Kg/Hr C.V. of Fuel = 44400 KJ/Kg Calculate:- (i) Brake Power. (ii) Indicated Power. (iii) Mechanical Efficiency. (iv) Indicated Thermal Efficiency.	June - 2009 + Sept. 2009 (similar)	07
3.	A six cylinder 4 Stroke IC Engine is to develop 89.5 KW indicated power at 800 rpm. The stroke to bore ratio is 1.25 : 1. Assuming mechanical efficiency of80% and brake mean effective pressure of 5 bar. Determine the diameter and strokeOf the Engine.	June - 2009	07
4.	What is the function of Governor? Classify the Governing methods used in I.C. engines and describe quantity method of Governing.	June - 2009	03
5.	Difference between Petrol (S.I.) engine and Diesel (C. I.) engine.	Sept. 2009 + July 2011 + Dec 2011	03
6.	In an ideal diesel cycle the temperature at beginning and at the end of Compression are 57.0 degree centigrade and 603 degree centigraderespectively. The temperatures at beginning and end of expansion are 1950degree centigrade and 870 degree centigrade respectively. Determine the idealefficiency of the cycle if pressure at beginning is 1.0 bar. Calculate: maximumpressure in the cycle.	Sept. 2009	07
7.	Why Diesel engines are called C.I. engines? Differentiate between S.I. andC.I. engine	Jan – 2010	04
8.	The following reading were taken during the test of four stroke singlecylinder petrol engine : Load on the brake drum = 50 kg Diameter of brake drum = 1250 mm Spring balance reading = 7 kg Engine speed = 450 rpmFuel consumption = 4 kg/hr Calorific value of the fuel = 43000 kJ/kg Calculate: (i) indicated thermal efficiency (ii) brake thermal efficiency.	Jan – 2010	07

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	Assume mechanical efficiency as 70%		
9.	A single stage single acting air compressor has intake pressure 1 bar anddelivery pressure 12 bar. The compression and expansion follows the law$pV^{1.3}$=constant. The piston speed and rotations of shaft is 180 m/min and350 rpm respectively. Indicated power is 30 kW and volumetric efficiencyis 92%. Determine bore and stroke.	Jan – 2010	07
10.	During testing of single cylinder two stroke petrol engine following data isobtained, Brake torque 640 NM, Cylinder diameter 21cm, speed 350 rpm, stroke28cm, m.e.p. 5.6 bar, oil consumption 8.16 Kg/hr, C.V. 42705 Kj/Kg . DetermineMechanical efficiency Indicated thermal EfficiencyBrake thermal efficiency Brake specific fuel consumption	April - 2010	07
11.	With neat sketch explain working of four stroke petrol engine.	April – 2010 + June 2010 + May 2012	04
12.	The following results refer to a test on C.I. engine Indicated power ---------- 37 KW Frictional power ---------- 06 KW Brake specific fuel consumption-------- 0.28 Kg/Kwh Calorific value of fuel ---------- 44300 KJ/Kg Calculate: (i) Mechanical efficiency (ii) Brake thermal efficiency (iii) Indicated thermal efficiency	June - 2010	07
13.	Draw P-V diagram for an ideal Diesel cycle and Derive an expression for itsair standard efficiency in terms of temperatures only.	June - 2010	05
14.	An engine operating on the ideal Diesel cycle has a maximum pressure of 44bar and a maximum temperature of 1600ºC.The pressure and temperature ofair at the beginning of the compression stroke are 1 bar and 27 ºCrespectively.Find the air standard efficiency of the cycle. For air take γ =1.4	June - 2010	07
15.	During a test on a single cylinder four stroke engine having compression ratio of 6,following data is recorded. Bore =10cm, Stroke=12.5 cm, imep =2.6 bar, dead load on dynamometer =60N,spring balance reading =19 N, Effective radius of flywheel =40cm, fuelconsumption =1Kg/hr.Calorific value of fuel is 42, 000 KJ/ Kg, speed =2000RPM,Determine its indicated power, brake power, mechanical, over all efficiency, airstandard and relative efficiency.	Dec - 2010	05
16.	Explain how I.C Engines are classified.	Dec - 2010	04
17.	A four cylinder 4-stroke petrol engine develops 200 kW brake power at 2500 rpm. Stroketo bore ratio is 1.2. If mean effective pressure is 10 bar and mechanical efficiency is 81%,calculate bore and stroke of the engine. Also calculate indicated thermal efficiency andbrake thermal efficiency if 65 kg/hr of petrol is	Jan 2011	07

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	consumed having calorific value of 42000kJ/kg		
18.	A 4 cylinder 2-stroke engine develops 30 kW at 2500 rpm. The meaneffective pressure of each cylinder is 800 kPa and mechanical efficiency =80 %. Calculate Brake power and mass flow rate of fuel if L/D = 1.5, Brakethermal efficiency = 28% and calorific value of fuel = 44000 kJ/kg	July 2011	07
19.	With neat sketch describe the working of two stroke cycle petrol engine.	Dec 2011	04
20.	A two stroke cycle internal combustion engine has a piston diameterof 110 mm and a stroke length of 140 mm. The mep exerted on thehead of the piston is 600 kN/m^2. If it runs at a speed of 1000 r.p.m.Find the indicated power developed.	May 2012	04
21.	Give difference between Two stroke and Four stroke I.C. Engine	May 2012	03
22.	The following data is available for 2-stroke diesel engine: Bore=10 cm, stroke=15 cm, engine speed=1000 RPM, Torque developed=58 N-m,η_m=80%, indicated thermal efficiency=40%, Calorific value of fuel=44000 KJ/Kg. Find: (a) Indicated Power,(b) Mean effective Pressure & (c) Brake Specific FuelConsumption.	Jan 2013	06
23.	Explain working of four stroke Diesel Engine with P-V diagram	Jan 2011 + June 2013	05
24.	A four cylinder four stroke petrol engine has 100mm bore and stroke is 1.3times bore. It consumes 4 kg of fuel per hour having calorific value of40500 kJ/kg. If engine speed is 850 rpm. Find its Indicated thermalefficiency. The mean effective pressure is 0.75 N/mm^2	June 2013	05
25.	During testing of single cylinder two stroke petrol engine following data wereobtained. Brake torque 640Nm, cylinder diameter 21cm, speed 350 rpm, strokelength 28 cm, mean effective pressure 5.6 bar, oil consumption 8.16 kg/hr, CV42705 kJ/kg. Determine (i) mechanical efficiency (ii) Indicated thermal efficiency (iii) Brakethermal efficiency (iv) brake specific fuel consumption.	Dec 2013 + June 2015	07
26.	Explain working of four stroke petrol engine with neat sketch & P-V diagram	June 2014 + Dec 2014	07
27.	A four cylinder two stroke petrol engine with stroke to bore ratio 1.2 develops 35 kW brake power at 2200 rpm. The mean effective pressure in each cylinder is 9 bar and mechanical efficiency is 78 %. Determine (1) Diameter and stroke of each cylinder (2) Brake thermal efficiency (3) indicated thermal efficiency. If fuel consumption 8 kg / hr having C.V=43000 kJ/kg.	June 2014	07
PUMPS			
1.	State the different types of centrifugal pumps. Describe diffuser type of centrifugal pump.	June - 2009	07
2.	Explain construction and working of centrifugal pump with sketch.	Sept. 2009 + Dec 2014	04

Sr. No.	Detail	GTU Year	Marks
3.	What is priming? Why priming is required in centrifugal pump but not inreciprocating pumps?	Jan – 2010	03
4.	Write short note on Vane pump	Jan – 2010	03
5.	With neat sketch explain construction and working of gear pump and screwpump.	April - 2010	07
6.	Compare centrifugal pump and reciprocating pump.	April - 2010	04
7.	Classify the rotary pumps and describe with neat sketch working of a rotarygear pump.	June – 2010	06
8.	Explain following terms associated with pumpsi) Priming in Pumps ii) Head iii) Air chamber	Dec – 2010	06
9.	What is the function of a pump? Explain with neat sketch, working of centrifugal pump.	Jan 2011	07
10.	Classify centrifugal pumps. With neat sketch explain the function of eachpart of centrifugal pump.	July 2011 + June 2013	06
11.	Classify the centrifugal pump and explain with neat sketch the vertex type centrifugal Pump.	Dec2011	04
12.	Explain Double acting reciprocating pump with a neat sketch.	May 2012	04
13.	What do you understand by word pump? Draw neat sketch of single actingreciprocating pump with nomenclature.	Jan 2013	03
14.	What is compressor? Explain working of double acting reciprocating pump andbucket pump with neat sketch.	Dec 2013	07
15.	What do you mean by priming of centrifugal pump? Explain single acting reciprocating pump.	June 2014	07
	AIR COMPRESSORS		
1.	Prove that the work done per Kg of air in Reciprocating Air Compressor neglecting clearance volume is given by $W = RT1\ n / (n-1) [(R_p) (n-1)/n - 1]$, Where R_p = Pressure Ratio.	June - 2009	04
2.	Air is to be Compressed in a single stage reciprocating compressor from 1.013 bar and 15°C to 7 bar. Calculate the indicated power required for a free air delivery of0.3 m^3 / min when the compression process is. (i) Isentropic (ii) Reversible Isothermal (iii) Polytropic with n= 1.25 . What will be the delivery temperature in eachcase ? Neglect clearance.	June - 2009	07
3.	Derive an expression for compressor without clearance $W = P * V * \log_e(P_2/P_1)$ for isothermal compression.	Sept. 2009	06
4.	A single stage air compressor is required to compress 94-m3 air/min from 1bar and 25º C to 9 bar. Find the temperature at the end of compression,work done, power required and heat rejected during each of the followingprocess (i) isothermal (ii) adiabatic (iii) polytropic following the law$pV^{1.25}$=constant. Assume no clearance.	Jan – 2010	07
5.	How are air compressors classified?	April - 2010	03
6.	A single stage reciprocating air compressor is required to compress 1 kg of air from 1 bar to 5 bar. Initial temperature of air is 27 °C.	April - 2010	07

Sr. No.	Detail	GTU Year	Marks
	Calculate work forisothermal , isentropic and polytrophic compression for n= 1.25		
7.	State the advantages of multistage compressor and explain with P-Vdiagram the working of two stage compressor.	June – 2010	05
8.	A single stage reciprocating air compressor is required to compress 1Kg of air from1 bar to 5 bar. Initial temperature of air is 27 °C. Calculate work required forisothermal, and poly tropic compression with n=1.25	Dec - 2010	04
9.	A single cylinder , single acting air compressor has a cylinder diameter of150mm and stroke of 300mm. it draws air into its cylinder at a pressure of 1bar and temperature 27 ºC.This air is then compressed adiabatically to apressure of 8 bar if the compressor runs at a speed of 120rpm Find, (i) Mass of the air compressed per cycle (ii) Work required per cycle (iii) Power required to drive the compressor Neglect the clearance volume and take R= 0.287 KJ/KgK	June – 2010	06
10.	State uses of compressed air and explain how compressors are classified	Dec – 2010 + May 2012	04
11.	What is air compressor? Air is to be compressed through a pressure ratio of 10 from apressure of 1 bar in a single stage air compressor. Free air delivery is 3 m^3 /min. Sweptvolume = 14 litres. Index of compression is 1.3. Neglect clearance volume. Calculate (1)power required in kW (2) Rotational speed of the compressor	Jan 2011	07
12.	With usual notations prove that volumetric efficiency of reciprocating aircompressor is 1–C [(P_2 / P_1)1/n – 1] , where C = clearance volume ratio.	July 2011	04
13.	Classify rotary air compressors. Explain the construction and working ofcentrifugal compressor with neat sketch.	July 2011	07
14.	Classify the air compressor . Differentiate between reciprocating compressor and rotary compressor	Dec 2011	07
15.	A single stage air compressor is required to compress 72 m3 of air per minute from 150C and 1 bar to 8 bar pressure. Find the temperature at the end of the compression, work done, power and heat rejected during each of the following processes : (i) Isothermal compression (ii) Polytropic compression following the law $pV^{1.25}$= C. Neglect Clearance.	May 2012	07
16.	What are the applications of compressor? Derive an expression of work done forsingle stage single acting reciprocating air compressor without clearance.	Jan 2013	07
17.	Explain difference between Reciprocating and Rotodynamic compressor.	June 2013	05
18.	What is compressor? Give uses of compressed air.	Dec 2014	04
19.	Classify Air Compressors. Give the uses or application of	June 2015	07

Sr. No.	Detail	GTU Year	Marks
	compressed air.		
	REFRIGERATION & AIR CONDITIONING		
1.	Why air conditioning is required in air craft ?	June - 2009	03
2.	With neat sketch describe the working of simple vapour compression refrigeration Cycle. (Drawing p-h and T-Ø chart)	June - 2009	04
3.	Explain window air conditioner along with its advantages	Sept. 2009	04
4.	Make comparison between vapour compressions and vapour absorption system	Sept. 2009	04
5.	Explain with flow diagram, the working of a vapour absorption refrigerator.	Jan – 2010 + June 2013	04
6.	Define air conditioning. State the basic components of air conditioningsystem.	Jan – 2010	03
7.	What are refrigerants? State their desirable characteristics of refrigerants	April - 2010	04
8.	Draw line diagram of vapour compression refrigeration cycle and represent onP-h and T-S diagram and state function of individual components of vapourcompression refrigeration system.	April – 2010 + Dec 2014 + June 2015	07
9.	Define air conditioning and classify the air conditioning systems	June - 2010	03
10.	Describe with neat sketch vapor compression refrigerating system	June – 2010 + May 2012	05
11.	With neat sketch explain construction and working of window air-conditioner	Dec – 2010	08
12.	Explain with neat sketch vapor compression refrigeration cycle. What is C. O. P.?	Jan 2011	07
13.	Explain Bell-Coleman air refrigeration cycle.	July 2011	04
14.	Write short note on domestic refrigerator.	July 2011	04
15.	With neat sketch explain vapour compression refrigeration cycle.	Dec 2011	04
16.	Explain with neat sketch split air conditioner. State its advantages.	Dec 2011	07
17.	What is refrigerant? State the most widely used refrigerant.	Dec 2011	03
18.	What should be the properties of common refrigerants?	Jan 2013+ June 2014	05
19.	What is refrigeration? What is refrigeration effect? Explain window air conditionerwith neat sketch.	Dec 2013	07
	COUPLINGS, CLUTCHES & BRAKES		
1.	What is function of Coupling? Name only various types of couplings. Explain Oldham coupling.	June – 2009 + June 2013	04
2.	Differentiate between Clutch and Brake.	Sept. 2009 + Dec – 2010 + Jan 2013 + June 2015	04

Sr. No.	Detail	GTU Year	Marks
3.	Give the classification of brake and describe with neat sketch the workingprinciple of an internal expanding shoe brake.	Jan – 2010	04
4.	Explain with neat sketch the working of cone clutch. What are theadvantages of cone clutch compare to disc clutch?	Jan – 2010	04
5.	What is function of clutch in an automobile? List different types of clutchesused in automobiles	April - 2010	03
6.	What is function of coupling? Explain any one type of coupling used to connecttwo shafts.	April - 2010	03
7.	What is the function of a brake? Explain with neat sketch the working of aninternal expanding shoe brake.	June - 2010	06
8.	Explain (i) muff coupling (ii) single plate clutch (iii) band brake	Jan 2011	07
9.	Differentiate brake and clutch. Explain Band brake.	July 2011	04
10.	Explain centrifugal clutch.	July 2011	04
11.	Distinguish between a coupling and a cluth.	May 2012	03
12.	Draw and explain Internal expanding brake.	June 2013	04
13.	What is brake? Describe an internal expanding shoe brake with a neat sketch andstate its applications.	Dec 2013	07
14.	Explain flange coupling with neat sketch	June 2015	07
	TRANSMISSION OF MOTION & POWER		
1.	Write short note on Helical gear.	June - 2009	04
2.	Compare individual drive and group drive,	Sept. - 2009 + June - 2010 +	04
3.	What are the materials used for belts. Compare flat and V – belt drive.	Sept. 2009	06
4.	State the application, advantages and disadvantages of (i) belt drive (ii)chain drive (iii) gear drive	Jan – 2010 + June - 2010	06
5.	Draw neat and labeled sketches of following (i) open belt drive (ii) quarter twist drive (iii) fast and loose pulley drive (iv) stepped pulley drive	April - 2010	07
6.	Compare belt and gear drive.	April - 2010	04
7.	List advantages and disadvantages of gear drive	Dec - 2010	04
8.	What do you understand by gear train? Discuss various types of gear train.	Dec - 2010	04
9.	Explain in brief (i) worm gears (ii) rack and pinion (iii) crossed belt drive	Jan 2011	07
10.	What are belt drives? List various belt drives and explain cross belt drive.	July 2011	06
11.	With simple sketch explain working of disc clutch.	Dec 2011	04

Sr. No.	Detail	GTU Year	Marks
12.	Give comparison of belt drive, Chain drive and gear drive.	May 2012	04
13.	What are different elements to transfer motion and power? Explain any one withneat sketch.	Jan 2013	04
14.	Sketch and describe helical and bevel gear and state applications of each.	Dec 2013	04
15.	Explain types of belt drive.	June 2014 + Dec 2011	07
16.	Differentiate: (i) Belt drive, chain drive and gear drive	June 2015	02
ENGINEERING MATERIALS			
1.	Write short notes on Composite materials.	June - 2009	03
2.	Enlist physical properties of Engineering materials	June - 2009	04
3.	Define ductility, plasticity, force and mass.	Sept. 2009	04
4.	What do you understand by non-metallic materials? Name any six and statetheir practical importance.	Jan – 2010	04
5.	Enlist properties of copper? State their applications	April - 2010	03
6.	Describe in brief the various non-ferrous metals along with their applications	June - 2010	06
7.	State three Engineering application of following materials, i) Diamond ii) Composite materials.	Dec – 2010	06
8.	Write note on the following engineering materials: (i) mild steel (ii) plywood (iii) fireclay	Jan 2011	07
9.	Define : Malleability , Compressive strength , Toughness and Brittleness.	July 2011	04
10.	State the important properties of engineering materials.	May 2012	04
11.	What is the difference between ferrous and nonferrous materials? List out variousferrous and nonferrous materials with their application.	Jan 2013	06
12.	Define (i) Hardness (ii) Creep (iii) Resilience (iv) Toughness.	June 2013	04
13.	Define elasticity, rigidity, hardness, fatigue, ductility, brittleness	Dec 2013	03
14.	Classify properties of engineering material. Explain any three of them.	June 2013	07