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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester B.E. (Credit System) Degree Examinations

Make up Examinations – January 2016

15ME104 – ELEMENTS OF MECHANICAL ENGINEERING

Duration: 3 Hours | Max. Marks: 100

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

		Marks	BT*
	Unit – I		
1. a)	Define i) Wet steam ii)Enthalpy of superheated steam iii) External work of evaporation	6	L*1
b)	Find the enthalpy required to produce 5kg of i) Dry saturated steam ii) Superheated steam at 200°C at 6 bar, from water at 30°C. The specific heat of water C_{pw}=4.18 kJ/kgK C_{ps}=2.25 kJ/kgK. At 6 bar T_s=158.8 °C, h_f=670.4 kJ/kg, h_{fg}=2085 kJ/kg.	6	L4
c)	Define a steam turbine. With a neat sketch explain the working principle of impulse steam turbine. Indicate the pressure – velocity changes.	8	L1
2. a)	Find the specific volume and enthalpy of 1 kg of steam at 0.8 MPa i) when the dryness fraction is 0.95 and ii) when the steam is superheated to temperature of 300°C. the specific heat of superheated steam is 2.25 kJ/kgK At 0.8 MPa Ts=170.4°C h_f=720.94 kJ/kg h_{fg}=2046.5 kJ/kg v_f=0.00115 m^3/kg v_g=0.2403 m^3/kg.	8	L4
b)	With a neat sketch explain the working of a Babcock &Wilcox Boiler.	10	L4
c)	With a neat sketch explain expansion of steam in the nozzle.	2	L2
	Unit – II		
3. a)	With a neat sketch explain the gas turbine where the working fluid is recirculated within the system.	5	L2
b)	Define the following: i) Indicated Power ii) Brake Power iii) Bore iv) Stroke v) Crank End	5	L2
c)	Explain the parts of IC Engine with the help of a neat sketch.	10	L2
4. a)	A 4 stroke, 4 cylinder diesel engine running at 2000 rpm develops a brake power of 60 kW. Brake thermal efficiency is 30%, calorific value is 42000kJ/kg and Mechanical efficiency is 80%. Engine has a bore of 120 mm and a stroke of 100 mm. Calculate i) fuel consumption ii) indicated thermal efficiency iii) Mean Effective Pressure.	6	L3
b)	Explain with a neat sketch Medium head water turbine.	8	L1
c)	Identify any six difference of the IC engines working on the principle of Constant Pressure cycle and Constant Volume Cycle.	6	L1
	Unit – III		
5. a)	Draw a neat sketch and explain the facing operation.	6	L4
b)	List the different abrasives & bonding materials used in grinding. Explain surface grinding.	8	L4
c)	With neat sketches distinguish between counter boring and counter sinking operations.	6	L2

P.T.O.

Unit – III

5. a) With a neat sketch write short notes on the following
   i) Counter sinking
   ii) Counter boring — 6
   b) With a neat sketch explain
   i) Slab milling operation
   ii) Slot milling operation. — 6
   c) With a neat sketch explain
   i) Surface grinding operation
   ii) Cylindrical grinding operation — 8

6. a) Explain the types of automation. With example. — 6
   b) Discuss the various industrial applications of robots. — 6
   c) Explain NC machine with simple block diagram. — 8

Unit – IV

7. a) With a neat sketch explain the working of reciprocating air compressor. — 6
   b) Draw a neat sketch of a room air-conditioner and explain its working principle. — 8
   c) What are the properties of a good refrigerant? Explain — 6

8. a) Explain the working of centrifugal pump with a neat sketch. — 6
   b) Explain with a neat sketch the working of a vapour absorption refrigerator. — 8
   c) Define
   i) Refrigerating effect.
   ii) Ton of refrigeration
   iii) GOP — 6

Unit – V

9. a) Find the power transmitted by a belt running over a pulley of 600mm diameter at 200 rpm. The co-efficient of friction between the belt and the pulley is 0.25, angle of lap 160° and maximum tension in the belt is 2500N. — 8
   b) Sketch and explain arc welding. — 6
   c) Explain briefly the metal joining processes of soldering, brazing and welding. — 6

10. a) List and explain the properties of a good lubricant.
   b) Sketch and explain the constructional features of a ball bearing. — 6
   c) A simple gear train is made up of 4 gears A,B,C and D having 20,40,60,70 teeth respectively. If gear A is the main driver rotating at 500 rpm clockwise. Calculate the speeds of the intermediate gears and the speed and the direction of the last follower. — 8

BT* Bloom's Taxonomy, L* Level — 6

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

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Second Semester B.E. (Credit System) Degree Examinations

April - May 2016

15ME104 – ELEMENTS OF MECHANICAL ENGINEERING

tion: 3 Hours Max. Marks: 100

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

		Marks	BT*
	Unit – I		
a)	A spherical vessel 0.5m diameter contains a mixture of saturated water and saturated steam at 300°C. The saturated water occupies one fourth of its volume and the remaining saturated steam. Calculate their masses and the dryness fraction of the mixture. Also find the enthalpy of the mixture. How much of heat is to be added to convert the mixture into dry saturated steam at the same pressure. From the steam tables for Ts=300°C, P=85.927 bar, v_f=0.001404 m^3/kg, v_g=0.02165 m^3/kg, h_f=1345kJ/kg, h_{fg}=1406kJ/kg.	8	L*4
b)	Define the following terms with respect to steam: 1) Saturation Temperature 2) Sensible Heat 3) Amount of Superheat 4) Degree of superheat 5) Dryness fraction 6) Dry steam.	6	L2
c)	Explain the working of Thermal Power plant using block diagram.	6	L2
a)	Find the specific volume and enthalpy of 1kg of steam at 0.8 MPa; 1) When the dryness fraction is 0.9 2) When the steam is superheated to a temperature of 300°C. The specific heat of superheated steam is 2.25 kJ/kgK. The properties of steam at 0.8MPa pressure are T_s=170.4°C, h_f= 720.94 kJ/kgK, h_{fg}= 2046.5 kJ/kgK, v_s=0.2403m^3/kg, v_f=0.001115m^3/kg.	6	L3
b)	What are boiler accessories? List and explain their working.	8	L1
c)	With a neat sketch explain the working principle of De Laval turbine. Indicate the pressure and velocity changes.	6	L2
	Unit – II		
a)	Explain the working of Pelton wheel turbine with a neat sketch.	6	L2
b)	With a neat sketch explain the working of a closed cycle gas turbine.	6	L2
c)	With a neat sketch explain the working of Two Stroke SI engine.	8	L2
a)	A person conducted a test on a single cylinder 2 stroke petrol engine and found that the mechanical and brake thermal efficiencies of the engine were 0.7 and 0.2 respectively. The engine with a mean effective pressure of 6 bar ran at 300 rpm, consuming fuel at a rate of 2.2 kg/hr. Given that the calorific value of the fuel is 42500 kJ/kg and that the stroke to bore ratio of the engine cylinder is 1.2 ($\frac{L}{d} = 1.2$). Find the bore and stroke of the engine.	8	L3
b)	Differentiate between Impulse and reaction water turbines.	6	L2
c)	Differentiate between spark ignition and compression ignition engines.	6	L2

P.T.O.

Unit – IV

7. a) Illustrate how pumps are classified based on their working principle.
   b) List and explain minimum of 6 thermodynamic properties of a good refrigerant.
   c) Show the main parts of a refrigerator system using a simple sketch and explain their functions.

8. a) Define the following.
      i) Refrigeration effect
      ii) Co-efficient of performance
      iii) Refrigerant
      iv) Condenser
   b) Explain the working principle of centrifugal pump with a neat sketch.
   c) Distinguish between vapour compression and vapour absorption refrigeration system based on different criteria.

Unit – V

9. a) What is a lubricant? Explain the desirable properties of a good lubricant.
   b) Define welding. How it is classified? Enumerate the general applications of welding.
   c) In a cross belt drive, the difference in tension between the tight and slack side is 1200 N. The angle of contact is 160° and the coefficient of friction is 0.28. Find the initial tension in the belt drive.

10. a) What are antifriction bearings? Enumerate their advantages and disadvantages.
    b) Explain the step-by-step general procedure for soldering. Also state the role of flux in soldering mentioning the names of commonly used fluxes.
    c) A compound gear train is formed by 4 gears P, Q, R and S. Gear P meshes with gear Q and gear R meshes with gear S. Gears Q and R are compounded. Gear P is connected to the driving shaft and gear S is connected to the driven shaft and the power is transmitted. The details of the gears are as follows:

Gears	P	Q	R	S
No. of teeth	30	60	40	80

If the gear S is to rotate at 60rpm, calculate the speed of gear P. Represent the gear arrangement schematically.

BT* Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

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First / Second Semester B.E. (Credit System) Degree Examinations

Make up / Supplementary Examinations – July 2016

15ME104 – ELEMENTS OF MECHANICAL ENGINEERING

Duration: 3 Hours Max. Ma 100

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

		Marks	BT*
	Unit – I		
1. a)	Define i) Superheated steam ii) Specific volume of wet steam iii) Internal energy of the steam.	6	L*1
b)	With a neat sketch explain the working of a Cochron boiler.	8	L4
c)	Differentiate between impulse and reaction steam turbine.	6	L4
2. a)	Find the quantity of heat supplied to produce 2kg of i) Dry saturated steam ii) Superheated steam at 350°C at 1MPa, from water at 40°C. The specific heat of water C_{pw}=4.18 kJ/kgK, C_{ps}=2.25 kJ/kgK. At 1MPa T_s=179.88°C, h_f=762.6kJ/kg, h_{fg}=2013.6 kJ/kg.	6	L4
b)	What is a boiler? Explain the role of mountings and accessories in boiler. List the boiler mountings.	8	L2
c)	Briefly explain different states of steam.	6	L2
	Unit – II		
3. a)	Explain the working of compression ignition IC engine, with the help of a neat sketch. Also draw the PV diagram for the same.	10	L2
b)	With the help of a neat sketch explain Low head Water turbine.	6	L2
c)	Difference between open cycle and closed cycle gas turbine.	4	L4
4. a)	The following observations were made during a test on a four stroke engine. Bore = 250 mm, stroke= 400 mm, crankshaft speed = 300 rpm, net load on brake drum = 700 N, diameter of the brake drum = 2 m, indicated mean effective pressure = 6 bar, fuel consumption = 0.0013 kg/sec. specific gravity of the fuel = 0.78, calorific value of the fuel = 43,900 kJ/kg. Find i) brake power ii) indicated power iii) frictional power iv) mechanical efficiency v) indicated thermal efficiency vi) brake thermal efficiency	10	L3
b)	Differentiate between Impulse and reaction water turbines.	5	L4
c)	Explain the following: i) Piston Ring ii) Crank and Crankshaft iii) Piston iv) Cylinder v) Flywheel	5	L2
	Unit – III		
5. a)	Define a machine tool. With a neat sketch explain the specifications of a lathe.	8	L4
b)	With neat sketches explain the processes of counter boring and drilling.	8	L4
c)	Distinguish between horizontal and vertical milling machines.	4	L2
6. a)	Distinguish between cylindrical and center less grinding processes.	4	L2
b)	Classify robots based on their configuration. With the help of a neat sketch describe polar configuration robot.	8	L4
c)	What are the areas in which automation can be applied? Explain the different types of automation.	8	L2

P.T.O.

b) Sketch and explain
   1. Counter Boring
   2. Counter Sinking

c) Name and explain with a sketch the milling operations required to produce the following groove
   1. T-Slots
   2. Flat Surface.

6. a) Define Robot. Discuss the different types of robot configurations.
   b) Discuss the various industrial applications of robots.
   c) With a simple block diagram, Explain the different components of CNC machine.

Unit – IV

7. a) Name the refrigerants that are commonly used. What are the thermodynamic properties of good refrigerant? Explain.
   b) With a neat sketch explain the working of air conditioning.

8. a) Sketch and name the important parts of vapour compression refrigerator.
   b) With a neat sketch explain the working of reciprocating air compressor.
   c) Define refrigeration. Explain the basic concept of refrigeration.

Unit – V

9. a) Give the classification of power transmission drives. List any 6 points to differentiate between belt and gear drives.
   b) Explain the different types of lubricants with an example for each type.
   c) Differentiate between welding and brazing.

10. a) An electric motor supplies 10kW power by an open belt drive. The diameter of the motor pulley is 300 mm and it rotates at 800 rpm. Calculate the tension on two sides of the belt if the ratio of tensions is 1.5.
    b) Explain how bearings are classified? Sketch and explain the construction of a ball bearing.
    c) Explain any 5 desirable properties of a good lubricant.

BT* Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

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First Semester B.E. (Credit System) Degree Examinations

November – December 2016

16ME104 – ELEMENTS OF MECHANICAL ENGINEERING

Duration: 3 Hours | Max. Marks: 100

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

			Marks	BT*
		Unit – I		
1.	a)	Give the functions of Boiler Mounting and Accessories: i) Economizer ii)Air preheater iii)Super heater iv) Blow off Valve	04	L*2
	b)	With the help of temperature-enthalpy diagram define different parameters that affect in the formation of superheated steam.	06	L1
	c)	Explain the working ofimpulse steam turbine with p-v diagram.	06	L2
	d)	The specific volume of steam at 10bar is 0.2428m^3/kg. Determine the condition of steam. Ts=179.9^{0}C v_g=0.194m^3/kg	04	L5
2.	a)	Explain the working of a Thermal Power Plant using block diagram.	05	L2
	b)	With neat sketch explain the construction and working of Water tube boiler.	10	L2
	c)	Determine the specific volume and enthalpy of 1kg of steam at 0.8MPa: a) when the dryness fraction is 0.9 and b) when the steam is superheated at a temperature of 300^{0}C.The specific heat od superheated steam is 2.25kJ/kgK. Given Ts=170.4^{0}C, hf=720.94kJ/kg, vg=0.2403m^3/kg,hfg=2046.5kJ/kg,vf=0.001115m^3/kg hg=2767.5kJ/kg	05	L5
		Unit – II		
3.	a)	With a neat sketch explain the working of an impulse water turbine.	06	L2
	b)	Draw a neat labeled sketch and explain the parts of an I.C engine.	08	L4
	c)	On a single cylinder 4 stroke petrol engine the following observations were obtained. Load on the brake drum = 50 kg Spring balance reading =10 kg Diameter of the brake drum =150 mm Fuel consumption =3kg/hour Calorific value of the fuel = 42000 kJ/kg Engine speed = 500 rpm Mechanical efficiency = 0.75 Calculate i) Brake Power ii) Brake Thermal Efficiency iii) Indicated Thermal Efficiency.	06	L3
4.	a)	Which type of I. C engines are employed in i) Mopeds ii) Bikes iii) Jeeps iv) Tractors	04	L1
	b)	Explain the working of a 2- stroke petrol engine with a neat sketch.	06	L5
	c)	Differentiate between open and closed cycle gas turbines.	06	L4
	d)	How are water turbines classified?	04	L4
		Unit – III		
5.	a)	With a neat sketch explain 1) Surface grinding operation 2) Cylindrical grinding operation	08	L2

P.T.O.