b) Differentiate between a vapour compression and a vapour absorption refrigeration system. 5

c) Explain any five thermodynamic properties of a good refrigerant. 5

Unit – IV

7. a) An open belt drive is used for power transmission from a driving shaft having larger pulley diameter of 400mm. The smaller pulley on driven shaft is having diameter of 250mm. The central distance between two shafts is 2.5m. If the axes of the two shafts are parallel and in the same plane, find the length of the belt required. Find also the length of the belt, if it is a cross belt drive. 5

b) Sketch and explain the construction of a ball bearing. 5

c) Give a step-by-step general procedure for welding. 6

d) Define the following properties of a good lubricant:
i) Viscosity ii) Flash point iii) Fire point iv) Cloud point. 4

8. a) Differentiate between soldering and brazing. 4

b) Explain the different types of lubricants with an example for each type. 6

c) Explain antifriction bearings. Also mention their advantages and disadvantages. 5

d) 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. 5

Unit – V

9 a) With neat sketches explain cylindrical and centreless grinding operations. 8

b) With neat sketches explain counter boring and counter sinking operations. 6

c) Explain fixed, programmable and flexible automation. 6

10. a) Sketch and explain the taper turning by swiveling the compound rest in a lathe. 6

b) Sketch and explain end milling and slot milling operations. 6

c) With sketches, discuss different types of physical configurations of a robot. 8

BT* Bloom's Taxonomy, L * level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

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

Make up/Supplementary Examinations – July 2018

17ME104 – ELEMENTS OF MECHANICAL ENGINEERING

Duration: 3 Hours | Max. Marks: 100

*Note: 1) Answer **Five full** questions choosing **One full** question from **each Unit.***
2) Assume missing data (if any) suitably.

			Marks	BT*
		Unit – I		
1.	a)	Explain the term 'dryness fraction of steam'. 6 kg of wet steam contains 0.56 kg of water particles in it. What is the dryness fraction of the steam?	4	L*3
	b)	State any five differences between water tube and fire tube boilers.	5	L2
	c)	Explain the working of a steam power plant with a neat diagram.	6	L4
	d)	State any five points to differentiate between impulse and reaction steam turbines.	5	L2
2.	a)	With a pressure-velocity diagram explain the working of De Laval turbine.	7	L2
	b)	One kg of superheated steam at 1.5MPa contains 3000 kJ of heat energy. Find the superheated temperature. If 500 kJ of heat energy is removed at the same pressure, what is the condition of the steam? At 1.5MPa pressure, T_s=198.29°C; h_f = 844.6 kJ/kg; h_{fg} =1945.5kJ/kg and h_g=2789.9 kJ/kg. The specific heat of superheated steam= 2.25 kJ/kg.	5	L3
	c)	What are boiler mountings and accessories? Give the functions of any three boiler mountings and accessories.	8	L1
		Unit – II		
3.	a)	With a neat sketch explain the working of a closed cycle gas turbine.	6	L4
	b)	With a neat sketch explain the working of a Kaplan turbine.	7	L4
	c)	A gas engine working on a four-stroke cycle has a cylinder of 250mm diameter, length of stroke 450mm and is running at 180rpm. Its mechanical efficiency is 80% when the mean effective pressure is 0.65 MPa. Determine indicated power, brake power and friction power.	7	L5
4.	a)	For a test on a single cylinder four-stroke petrol engine, the following data is available: Speed of the engine = 1000 rpm Net brake torque = 70 N-m, Indicated mean effective pressure = 10 bar, Rate of fuel consumption = 2.57 kg/h. Stroke = 150 mm and bore = 100 mm Calorific value of petrol = 41000 kJ/kg. Calculate indicated thermal efficiency, brake thermal efficiency and mechanical efficiency.	10	L3
	b)	Differentiate between open cycle and closed cycle gas turbines.	4	L2
	c)	With a neat sketch explain the working of a Pelton wheel.	6	L4
		Unit – III		
5.	a)	Give a detailed classification of pumps.	4	L4
	b)	With a neat sketch explain the working of a reciprocating air compressor.	7	L2
	c)	With a neat sketch explain the working of vapour absorption refrigeration system.	9	L4
6.	a)	With a neat sketch explain the construction and working of a centrifugal pump.	10	L4

P.T.O.

c) A compound gear train is formed by 4 gears P, Q, R & S. Gear P meshes with gear Q, and gear R meshes with gear S. Gears Q and R are compounded. P is connected to the driving shaft and S is connected to the driven shaft. Represent the gear arrangement schematically, If gear S were to rotate at 60 R.P.M. in clockwise direction. Calculate the speed and direction of P and the intermediate gears. Also determine the speed ratio. The details of the gears are as follows $T_p=30$, $T_q=60$, $T_r= 4$, $T_s= 80$. 6

8. a) With a neat diagram explain Oxy-Acetylene welding process. 8
   b) What are the differences between soldering and brazing? 6
   c) Find the power transmitted by a belt running over a pulley of 600mm diameter at 200 R.P.M. 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. 6

Unit – V

9. a) Explain the process of taper turning by swiveling the compound rest with a neat sketch. 8
   b) Explain with the help of sketches four machining operations that can be carried out in a drilling machine. 12

10. a) With a simple block diagram, Explain the different components of CNC machine. 8
    b) Mention the differences between NC and CNC Machine. 6
    c) Discuss the advantages and disadvantages of CNC machines in brief. 6

BT* Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

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

April – May 2018

17ME104 – ELEMENTS OF MECHANICAL ENGINEERING

uration: 3 Hours

Max. Marks: 100

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

			Marks	BT*
		Unit – I		
1.	a)	Draw a neat sketch of the Temperature Enthalpy diagram and Define i) Latent heat of evaporation ii) Amount of superheat iii) sensible heat.	8	L*1
	b)	With a neat sketch, Explain the working of the Fire tube boiler. Show the path of the hot flue gases.	12	L2
2.	a)	Define Turbine. Explain De Laval's turbine with a neat sketch and PV diagram.	8	L2
	b)	What are boiler accessories? List and explain their working.	6	L2
	c)	Find the specific volume and enthalpy of 1kg of steam at 0.8MPa. i) When the dryness fraction is 0.9 ii) When the steam is superheated to a temperature of 300°C. The specific heat of superheated steam is 2.25KJ/kgK. The properties of steam at 0.8MPa pressure are T_s=170.4°C, h_f= 720.94KJ/kgK, h_{fg}= 2046.5 KJ/kgK, v_g=0.2403m^3/kg, v_f=0.001115m^3/kg.	6	L3
		Unit – II		
	a)	Draw a neat sketch of high head, Tangential flow Impulse water turbine indicating the parts. Explain its working.	8	L4
	b)	What is water turbine? Show the classifications of water turbine.	6	L1
	c)	List the differences between Open cycle gas turbine and closed cycle gas turbine.	6	L2
	a)	Explain 4 Stroke SI engine with a neat sketch.	12	L2
	b)	Following observations are taken during a trial on 4-S Diesel engine. Bore diameter=25 cm, Stroke = 40 cm, Speed = 250 RPM, Brake Load = 70 Kg, Brake drum diameter = 2m, Mean effective pressure = 6 bar, Diesel consumption = 0.1 litre/min, specific gravity of fuel = 0.78, CV of fuel = 43900 KJ/Kg. Determine i) IP ii) BP iii) FP iv) Mechanical efficiency v) Brake thermal efficiency vi) indicated thermal efficiency.	8	L3
		Unit – III		
	a)	Explain the working principle of a Vapour compression refrigeration system with a neat sketch.	10	L2
	b)	What are the properties of the good refrigerant? Explain	6	L2
	c)	Define i) Ton of refrigeration ii) COP	4	L1
	a)	With a neat sketch explain the working of centrifugal pump.	8	L2
	b)	Draw a neat sketch of a room air-conditioner and explain its working principle.	12	L2
		Unit – IV		
	)	List and explain the properties of a good lubricant.	6	L4
	)	Sketch and explain the constructional features of a ball bearing.	8	L2

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