16ME104 Make up – January 2017

Unit – III

5. a) With a neat sketch explain the following lathe operations
   1. Facing
   2. Plane Turning
   3. Taper Turning — 10

   b) Explain with the help of sketches four machining operations that can be carried out in a drilling machine. — 10

6. a) Classify robots based on their configuration. With the help of a neat sketch describe Polar and Cartesian configuration robot. — 12

   b) What are the areas in which automation can be applied? Explain the different types of automation. — 8

Unit – IV

7. a) Define air compressor and explain the working of single stage air compressor with neat sketch. — 8

   b) Explain with a neat sketch the working of vapour compression refrigerator. — 12

8. a) With a neat sketch explain the working of centrifugal pump. — 6

   b) Explain the working of room air conditioner with neat sketch. — 8

   c) What are the properties of a good refrigerant? Explain. — 6

Unit – V

9. a) Two parallel shafts are connected by means of an open belt drive and placed at a distance of 3.2m apart. The diameter of the larger pulley is 600mm and that of the smaller pulley is 300mm. The shafts are in the same plane. Find the length of the belt. If the drive is crossed, what additional length of the belt is needed? — 7

   b) Explain any 6 important functions of a lubricant. — 6

   c) With a neat sketch explain the principle of electric arc welding. — 7

10. a) A simple gear train has four gears namely A, B, C and D. Gear A is driver gear and Gear D is driven gear. Gears B and C are intermediate gears. Gear A rotates in anticlockwise direction with a speed of 300 rpm. The number of teeth on gears A, B, C and D are 30, 90, 60 and 60, respectively. Determine the following:
    (i). The speed of the driven gear
    (ii). The speed of rotations of intermediate gears.
    (iii). The velocity ratio of gear trains.
    Show the gear train arrangement schematically. — 8

    b) Explain the following lubricant properties:
    (i). Flash and fire point
    (ii). Cloud and pour point
    (iii). Viscosity — 6

    c) Define soldering. List the step by step general procedure for soldering. — 6

BT* Bloom's Taxonomy, L* Level

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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 2017

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)	Define the following: i) Enthalpy of Dry Saturated Steam ii) Specific Volume of Superheated Steam iii) Enthalpy of evaporation iv) Dryness fraction v) Sensible heat	5	L*1
	b)	With neat sketch explain the construction and working of Water tube boiler.	10	L4
	c)	Two kg of dry saturated steam at 2 MPa is produced from the water at 40°c. Determine the quantity of heat supplied. The specific heat of water Cpw = 4.18 kJ/kg. Given Ts = 212.4° C h_{fg} = 1888.6 kJ/kg hf=908.6kJ/kg.	5	L5
2.	a)	Give Five differences between Impulse and Reaction Steam Turbines.	5	L1
	b)	Give the functions of Boiler Mounting: i) Pressure Gauge ii) Safety Valves iii) Feed Check Valve iv) Water Level Indicator v) Steam Stop Valve	5	L1
	c)	Explain the working of reaction steam turbine with p-v diagram.	5	L2
	d)	A mixture of saturated water and saturated steam at a temperature of250°C is contained is contained in a closed vessel of 0.1 m^3 capacity. If the mass of the saturated water is 2kg, Determine the mass of the steam in the vessel. Also find the specific volume, dryness fraction and the enthalpy of the mixture Given p=39.77bar,vf=0.0012513 m^3/kg, vg=0.05004m^3/kg,hf=1085.8kJ/kg and hfg=1714.6kJ/kg.	5	L5
		Unit – II		
3.	a)	With a neat sketch explain the working of a closed cycle gas turbine.	5	L1
	b)	List the differences between impulse and reaction water turbine.	4	L4
	c)	Explain with a neat sketch the working of a four stroke petrol engine.	7	5
	d)	A four stroke single cylinder I.C engine of 250mm cylinder diameter and 400mm stroke runs at a piston speed of 8 m/s. if the engine develops 50 kW indicated power, find its mean effective pressure and crankshaft speed.	4	L3
4.	a)	List the differences between open cycle and closed cycle gas turbines	6	L1
	b)	With a neat sketch explain the working of a Pelton wheel turbine	6	L1
	c)	The following observations were obtained during a trial on a four stroke diesel engine. Cylinder diameter =300mm Stroke of the piston =400mm Crank shaft speed = 250 rpm Brake load = 50kg Brake drum diameter = 2m Mean effective pressure = 6 bar Diesel oil consumption =0.1 m^3/min Specific gravity of diesel =0.78 Calorific value of diesel =43900 kJ/kg Find: 1. Brake Power 2. Indicated Power 3. Mechanical Efficiency 4. Brake Thermal Efficiency	8	L3

b) What is the principle of working of drilling machine?
Describe the following machining operations.
   i) Counter sinking
   ii) Centreless grinding

6. a) What are the needs to go for automation in the industries?
Briefly describe the characteristics of Fixed, programmable and Flexible automation systems.
   b) What is robotics? With schematic representations briefly explain three robotic configurations used in the industries.

Unit – IV

7. a) Give the classification of pumps.
Illustrate working principle and functioning of centrifugal pump.
   b) Describe the construction and working of vapor compression refrigeration system.

8. a) What are the desirable properties of a refrigerant?
Compare vapor compression and vapor absorption refrigeration system.
   b) Write short note on the following,
      i) COP
      ii) Unit of refrigeration
      iii) Applications of artificial cooling
      iv) Commonly used Refrigerants

Unit – V

9. a) What is power transmission system? What are its types and mention few applications of respective drive types.
   b) Write a note on following,
      i) Gear train
      ii) Types of lubricants
      iii) Worm gear
      iv) Types of bearing

10. a) Compare the principle and features of soldering and brazing.
   b) Briefly classify the welding processes. Illustrate different flame patterns obtained during Oxy-Acetylene gas welding process.

BT* Bloom's Taxonomy, L* Level

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

April - May 2017

16ME104 – ELEMENTS OF MECHANICAL ENGINEERING

on: 3 Hours — Max. Marks: 100

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

		Marks	BT*
	Unit – I		
a)	Describe the process of steam formation at constant pressure condition. Classify the steam based on their characteristics.	10	L*2
b)	What are the functions of the following in relevant applications? i) Fusible plug ii) Feed check valve iii) Steam trap iv) Air preheater v) Nozzle	10	L2
a)	Steam with 90% quality at 200°C is generated at constant pressure from 1kg of water at 20°C. Assume C_{pw} = 4.1868kJ/kgK & C_{ps} = 2.25 kJ/kg K. Considering, h_f= 852.4kJ/kg, h_{fg} = 1941 kJ/kg, V_g =0.1272m^3/kg , V_f = 0.00112 m^3/kg, Determine, a. Heat added to get steam with 90% quality. b. Heat required to be added to form dry saturated steam. c. Volume of boiler vessel to contain dry steam. d. What is the degree of superheat on addition of 300kJ of energy to dry steam.	10	L5
b)	Explain the constructional features and working of a fire tube boiler.	10	L4
	Unit – II		
a)	Give the detailed classification of hydraulic turbines. With neat diagram illustrate the functioning of an Axial flow-reaction water turbine.	10	L4
b)	What are the functions of the following turbine components? i. Draft tube ii. Buckets iii. Spiral casing iv. Combustion chamber v. Cooler	10	L2
a)	A 4 cylinder 2 stroke petrol engine develops 30000 W at 2500r.p.m. The mean effective pressure on a piston is 8bar and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder, stroke to bore ratio is 1.5. Also calculate the frictional loss and fuel consumption if the brake thermal efficiency is 28%.The calorific value of the fuel is 43900 kJ/kg.	10	L4
b)	With neat sketches describe the principle and working of a 4 stroke spark ignition engine.	10	L4
	Unit – III		
a)	What is the principle of working of a lathe machine? With a neat sketch explain the following machining operations i) End milling ii) Taper turning	10	L4

P.T.O.

6. a) Draw diagrams & explain the working principle of reciprocating air compressor 7
   b) What is refrigeration, highlight the use of the following refrigeration system parts. i) Evaporator & ii) Condenser iii) Expansion Device 7
   c) Define i) Refrigeration effect ii) Ton of Refrigeration iii) COP 6

Unit – IV

7. a) An electric motor provides 6KW power to an open belt drive. The diameter of the motor pulley is 200 mm and it rotates at 900 RPM. Calculate tight and slack side tension in the belt if the ratio of tension is 2. 7
   b) Draw a Spur and bevel gear and identify its application. 7
   c) Draw diagram & explain the Ball bearing. 6

8. a) A driven pulley of 400 mm diameter of a belt drive, runs at 200RPM. The angle of lap is 165° and coefficient of friction between the belt material and pulley is 0.25. Find power transmitted if initial tension not to exceed 10KN. 7
   b) Give difference between welding and brazing. Give one application for each. 7
   c) Explain simple and compound Gear trains with neat sketches. 6

Unit – V

9. With diagrams explain the following machining operations. i)Turning ii) facing iii) drilling iv) Counter Sinking v) Slot milling 20

10. a) With diagrams explain Surface grinding, Cylindrical grinding. 10
    b) With help of block diagram highlight the elements of CNC system. Give its advantage and disadvantages. 10

BT* Bloom's Taxonomy, L* Level

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

November – December 2017

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) Draw Neat Sketches Wherever Necessary.
3) Assume missing data if any suitably.

		Marks	BT*
	Unit – I		
a)	Draw diagram and explain a Cochran boiler.	10	L2
b)	5 kg of wet steam of dryness fraction 0.8 passes from a boiler to a superheater at a constant pressure if 1MPa. In the superheater if its temperature increases to 350°C determine the amount of heat supplied in the superheater. The specific heat of superheated steam C_{ps}= 2.25kJ/kgK, T_s= 179.88 °C, h_f= 762.61kJ/kg, h_{fg}= 2013.6 kJ/kg	5	L3
c)	Explain the process of formation of steam with a sketch.	5	L2
a)	Define the following i) Sensible heat ii) Latent heat of vaporization iii) Dryness fraction iv) Enthalpy of superheated steam v) Specific volume of dry steam	5	L1
b)	Demonstrate Working of a Thermal Power Plant using block diagram.	10	L4
c)	What are Boiler Mountings and Accessories? What is their necessity? Give examples to Boiler Mountings and Accessories.	5	L2
	Unit – II		
a)	Draw diagram and explain an Open cycle gas turbine.	7	L2
b)	Demonstrate Working of a Hydro Electric Power Plant with help of diagram.	7	L2
c)	On a single cylinder four stroke petrol engine following reading were taken, Cylinder diameter 20cm, Stroke length 40cm, Indicated mean effective pressure 7 bar, fuel consumption 10 liters/hour, calorific value of the fuel 45000 kJ/kg, engine speed 400 RPM, specific gravity of fuel 0.8, torque 0.5kNm. Find i) Brake power ii) Indicated power iii) Brake thermal efficiency & iv) Indicated thermal efficiency	6	L3
a)	Draw diagram and explain an Francis turbine.	7	L2
b)	With help of diagrams explain a four stroke Petrol engine.	7	L2
c)	On a single cylinder four stroke petrol engine following reading were taken, Load on brake drum 40kg, spring balance reading 5kg, brake drum diameter 120cm, fuel consumption 3kg/hour, calorific value of the fuel 42000kJ/kg, engine speed 500 RPM, Indicated power 15kW. Find i) Brake power ii) Brake thermal efficiency & iii) Indicated thermal efficiency	6	L3
	Unit – III		
a)	Draw diagram & explain the working principle of centrifugal liquid pump.	7	L2
b)	Explain with a neat sketch working of a vapor compression refrigeration system.	7	L2
c)	Explain any six properties of a good refrigerant.	6	L1

P.T.O.