Hall Ticket Number :										

R-15

Code: 5G551

III B.Tech. I Semester Supplementary Examinations May 2019

Applied Thermodynamics-II

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Draw diagram of Rankine cycle using dry-saturated steam and develop the equation for the Rankine cycle efficiency. 6M

   b) Steam power plant has boiler and condenser pressures of 60 bar and 0.1 bar respectively. Steam coming out of the boiler is dry and saturated. The plant operates onthe Rankine cycle. Calculate thermal efficiency. 8M

OR

2. a) What are the advantages and disadvantages of regenerative cycle over simple Rankine cycle? 6M

   b) A power generating plant uses steam as working fluid and operates at boiler pressure of 50 bar, dry saturated and condenser pressure of 0.5 bar. Calculate for these limits i) the cycle efficiency and ii) the work ratio and iii) specific steam consumption for Carnot cycle and Rankine cycle. 8M

UNIT–II

3. a) Explain significance of boiler mountings and accessories. 7M

   b) What are the differentiating features between a water tube and a fire tube boiler? 7M

OR

4. a) Discuss the merits and demerits of forced draught over natural draught. 6M

   b) Calculate the height of a chimney required to produce a draught equivalent to 1.7cm of water if the flue gas temperature is 270^0C and ambient temperature is 22^0C and minimum amount of air per kg of fuel is 17kg. 8M

UNIT–III

5. a) Mention various types of nozzles and distinguish their features. 4M

   b) Calculate the throat and exit diameters of a convergent- divergent nozzle, which will discharge 820 kg of steam per hour at a pressure of 8 bar Superheated to 220^0C into a chamber having a pressure of 1.5 bar. The friction loss in the divergent portion of the nozzle may be taken as 0.15 of the isentropic enthalpy drop. 10M

OR

6. a) What are the types of Condensers? Classify. 4M

   b) A surface condenser is designed to handle 10000 kg of steam per hour. The steam enters at 0.08 bar, 0.9 dryness and the condensate leaves at the corresponding saturation temperature. The pressure is constant throughout the condenser. Estimate the cooling water flow per hour, If the cooling water temperature rise is limited to 10^0C. 10M

UNIT–IV

7. a) Why compounding is necessary in the steam turbines? What are the types and explain any one type of compounding with neat sketch. 6M

   b) In a single-stage impulse turbine, the steam jet leaves the nozzles at 20º to the plane of the wheel at a speed of 670 m/s and it enters the moving blades at an angle of 35º to the drum axis. The moving blades are symmetrical in shape. Determine the blade velocity and diagram efficiency. 8M

OR

8. An impulse turbine of 1MW has steam entering at 20 bar 300^0C and steam consumption of 8 kg per kW hour. Steam leaves at 0.2 bar and 10% of total heat drop is lost in overcoming friction in deveining portion of nozzle. If throat diameter of each nozzle is 1 cm then determine (i) the number of nozzles required (ii) exit diameter of each nozzle. Solve using mollier diameter. 14M

UNIT–V

9. a) Derive the condition for maximum efficiency and blade height of reaction turbine. 6M

   b) In a Parson reaction turbine, the angles of receiving tips are 35^0 and of discharging tips, 20^0. The blade speed is 100 m/s. Calculate the tangential force, power developed, diagram efficiency and axial thrust of the turbine, if its steam consumption is 1 kg/min. 8M

OR

10. a) (i) What is a heat engine?
    (ii) Why is steam engine known as a prime mover?
    (iii) Distinguish between external combustion and internal combustion engines. 6M

    b) Steam is admitted to the cylinder of steam engine at a pressure of 735 kPa and cut-off takes place at 0.4 of the stroke. The back pressure is 29-5 kPa. Calculate the hypothetical mean effective pressure on the piston during the stroke. 8M

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Hall Ticket Number :										

R-15

Code: 5G554

III B.Tech. I Semester Supplementary Examinations May 2019

Design of Machine Elements-I

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Write the mechanical properties of the material to be considered while designing of machine component. 7M

   b) Find out the numbers of R10 basic series from 1 to 10. 7M

OR

2. a) Discuss the following
      i) Maximum Principal strain theory
      ii) Distortion Energy Theory 6M

   b) A shaft of 25mm diameter is subjected to a torque of 60N-m and a bending moment of 90N-m and an axial load of 6 KN. Calculate factor of safety according to
      i) Maximum normal stress theory and
      ii) Maximum shear stress theory

   Assume yield strength of the shaft material as 400MPa 8M

UNIT–II

3. a) What is stress concentration? Give three examples with sketches how to minimize the stress concentration. 7M

   b) Determine the size of a piston rod subjected to a total load having cyclic fluctuation from 150 KN (compression) to 25 KN (tension). The endurance limit is 360 MPa and yield strength is 400 MPa. Take factor of safety = 1.5; surface finish factor = 0.88 and stress concentration factor = 2.25. 7M

OR

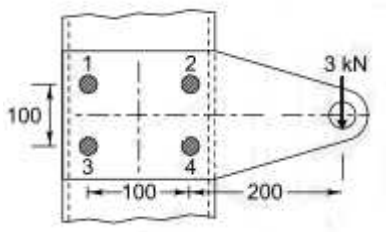
4. a) Develop the equations for Soderberg and Goodman criterion. 7M

   b) A forged steel bar, 50 mm in diameter, is subjected to a reversed bending stress of 250 N/mm^2. The bar is made of steel 40C8 (S_{ut}= 600 N/mm^2). Calculate the life of the bar for a reliability of 90%. 7M

UNIT–III

5. a) What is meant by bolt of uniform strength? Explain how can it will be obtained. 6M

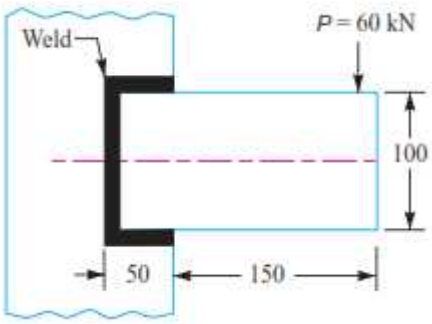
   b) A steel plate subjected to a force of 3 kN and fi xed to a vertical channel by means of four identical bolts is shown in Fig. 1. The bolts are made of plain carbon steel 45C8 (S_{yt}=380N/mm^2) and the factor of safety is 2. Determine the diameter of the shank.



8M

OR

6. A rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load P, as shown in Fig. 1. Determine the weld size if shear stress in the same is not to exceed 140 MPa.



14M

UNIT–IV

7. a) What are the applications of cotter joints? 2M

   b) Two rod ends of a pump are joined by means of a cotter and spigot and socket at the ends design the joint for an axial load of 100 kN which alternately changes from tensile to compressive. The allowable stresses for the material used are 50 MPa in tension, 40 MPa in shear and 100 MPa in crushing. 12M

OR

8. a) Explain the stresses induced in keys. 4M

   b) Design a Knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. 10M

UNIT–V

9. a) How the shaft is designed when it is subjected to twisting moment and axial stress? 4M

   b) A shaft is transmitting 97.5 kW at 180 r.p.m. If the allowable shear stress in the material is 60 MPa, find the suitable diameter for the shaft. The shaft is not to twist more than 1° in a length of 3 m. Take C = 80 GPa. 10M

OR

10. a) Explain types of couplings. 4M

    b) Design a bushed-pin type flexible coupling for connecting a motor shaft to a pump shaft, with the following service conditions:

    Power to be transmitted = 40kW

    Speed of the motor shaft = 1000rpm

    Diameter of motor and pump shafts = 45mm

    Bearing pressure on the rubber bush = 0.7N/mm^2.

    Allowable stress in the pins = 60MPa. 10M

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Hall Ticket Number :										

R-15

Code: 5G552

III B.Tech. I Semester Supplementary Examinations May 2019

Dynamics of Machinery

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Derive an expression for the efficiency of an inclined plane when a body moves up a plane. 6M

   b) A thrust bearing of a propeller shaft consists of a number of collars. The shaft is of 400 mm diameter and rotates at a speed of 90 rpm. The thrust on the shaft is 300 kN. If the intensity of pressure is to be 200 kN/m^2 and coefficient of friction is 0.06, determine the external diameter of the collars and the number of collars. The power lost in the friction is not to exceed 48 kW. 8M

OR

2. a) Sketch and explain the Disc Clutch (Single - Plate). 6M

   b) A conical friction clutch is used to transmit 90 kW at 1500 rpm. The semi cone angle is 20^0 and the coefficient of friction is 0.2. If the mean diameter of the bearing surface is 375 mm and the intensity of the normal pressure is not to exceed 0.25 N/mm^2, determine the dimensions of the conical bearing surface and the axial load required. 8M

UNIT–II

3. a) Sketch and explain the Internal expanding shoe brake. 6M

   b) With a neat sketch, explain the Rope Brake Dynamometer. 8M

OR

4. a) What do you mean by Gyroscopic couple and derive a relation for its magnitude? 6M

   b) A ship has a propeller of mass moment of inertia 2000 kgm^2. The propeller rotates at a speed of 360 rpm in clockwise sense looking from stern. Determine the Maximum gyroscopic couple and its effect when ship pitches and moving up having amplitude 10^0 and time period 20 seconds. The motion occurs with simple harmonic motion; 8M

UNIT–III

5. The equation of a turning moment curve of a three crank engine is 2500 + 750 Sin3θ Nm, where θ is the crank angle in radians. The mean speed of the engine is 300 rpm. The flywheel and other rotating parts attached to the engine have a mass of 500 kg at a radius of gyration 1 m. Calculate:
   (i) the power of the engine,
   (ii) the total fluctuation of the speed of the flywheel in percentage, when
   (a) The resisting torque is constant.
   (b) The resisting torque is 2500 + 300 Sinθ Nm. 14M

OR

6. a) Differentiate between the Governor and the Flywheel. 6M

   b) In a Porter Governor all arms are equal in length of 250 mm. The upper and lower arms are pivoted to links of 40 mm and 50 mm respectively from the axis of rotation. Each ball has a mass of 5 kg and the sleeve mass is 50 kg. The force of friction on the sleeve of the mechanism is 40 N. Determine the range of speed of the governor for extreme radii of rotation of 125 mm and 150 mm. 8M

UNIT–IV

7. a) Prove that the resultant unbalanced force in single cylinder reciprocating engine is minimum, when half of the reciprocating masses are balanced by rotating masses. 6M

   b) Derive an expression for variation in tractive force and swaying couple for an uncoupled two cylinder locomotive engine. 8M

OR

8. The firing order in a six cylinder four-stroke in line engine is 1-4-2-6-3-5. The piston stroke is 100 mm and the length of each connecting rod is 200 mm. The pitch distance between cylinder centre lines are 100 mm, 190 mm, 150 mm and 100 mm successively. The reciprocating mass per cylinder is 0.75 kg and the engine runs at 3000 rpm. Determine the out of balance primary and secondary force and couples on this engine, by taking a plane midway between cylinders 3 and 4. 14M

UNIT–V

9. a) In a spring- mass vibrating system, the natural frequency of vibration is 3.56 Hz. When the amount of the suspended mass is increased by 5 kg, the natural frequency is lowered to 2.9 Hz. Determine the original unknown mass and the spring constant. 6M

   b) Describe Dunkerley's method to find the natural frequency of a shaft carrying several loads. 8M

OR

10. a) Distinguish between longitudinal, transverse and torsional free vibrations. 6M

    b) Two flywheels with moment of inertia of 4.2 kg-m^2 and 6.6 kg-m^2 are separated by a uniform shaft of 685 mm long. Stiffness of the shaft is 27×10^5 N-m/rad. Determine the position of the node and the natural frequency of torsional vibrations. 8M

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Hall Ticket Number :										

R-15

Code: 5G555

III B.Tech. I Semester Supplementary Examinations May 2019

Heat Transfer

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. A solar radiant heat flux of 700 W/m^2 is absorbed in a metal plate that is perfectly insulated on the back side. The convection heat transfer coefficient on the plate is 11 W/m^2-K. and the ambient air temperature is 300 K. Calculate the temperature of the plate under equilibrium conditions.

OR

2. From First principle, derive the 2-D governing equation of conduction heat transfer in rectangular coordinate for the following conditions. Steady state, incompressible, isotropic material, without heat generation.

UNIT–II

3. The handle of a ladle used for pouring molten lead at 327^{O}C is 30 cm long and is made of 2.5 X 1.5 cm mild steel bar stock (k = 43 W/m-K). In order to reduce the grip temperature, it is proposed to make a hollow handle of mild steel plate1.5 mm thick with same rectangular shape. If the surface heat transfer coefficient is 14.5 W/m^2-K and the ambient air is 27^{O}C, estimate the reduction in temperature of the grip.

OR

4. A long cylindrical rod made of copper is 2 cm in diameter is at -190^{O}C. It is exposed to warm air at a temperature of 50^{O}C. Find the time taken by the rod to heat up to a temperature of 10^{O}C if the surface heat transfer coefficient is 20 W/m^2-K. For copper Thermal conductivity = 330W/mK, and thermal diffusivity = 95X10^{-6} m^2/s. Justify if you can neglect the internal resistance of the cylindrical rod.

UNIT–III

5. Air at 1 bar and 40^{O}C flows parallel to and on both sides of a flat plate (20 cm^2) with a velocity of 15 m/s. If the plate is maintained at a temperature of 20^{O}C, calculate the rate of heat transfer to the plate and the drag acting on the plate. Air properties are density = 1.13 kg/m^3, k = 0.0276 W/m-K, Pr = 0.699, kinematic viscosity = 16.96 X 10^{-6} m^2/s.

OR

6. Define and explain the hydrodynamic and thermal boundary layers. How does their thicknesses vary with Prandtl Numbers. Consider a vertical plate (0.5 m high) maintained at a temperature of 100^{O}C and losing heat by natural convection to air at 1 bar and 40^{O}C. Show that the flow is laminar or turbulent.

UNIT–IV

7. Two concentric spheres have diameters of 50 cm and 25 cm. The inner sphere is maintained at 10 K and the outer sphere is maintained at 300 K. A radiation shield of 35 cm diameter is placed in the annulus. The annulus is completely evacuated. If all the radiating surfaces have the emissivity 0.05, calculate the net radiation heat transfer between the surfaces a) with and b) without the radiation shield.

OR

8. a) Draw and explain the different phases of pool boiling.

   b) What is the estimated surface temperature of Sun? How it has been calculated.

UNIT–V

9. A double tube heat exchanger is used to heat the oil (flow rate 1110 kg/hr and specific heat 2.1 kJ/kg-K) from 27^{O}C to 49^{O}C. Oil flows through the inner copper tube(OD 2.86 cm, ID 2.54 cm). The oil is heated by hot water flowing through the outer tube flowing at 390 kg/hr at the inlet temperature of 93^{O}C. The surface heat transfer coefficients on the oil side and water side are 635 W/m^2-K and 1270 W/m^2-K respectively. Take the thermal conductivity of copper is 350 W/m-K. Calculate the length of the heat exchanger tube when it is a counter flow type.

OR

10. a) Give a detailed classification of heat exchangers used for industrial applications.

    b) For a counter flow heat exchanger, effectiveness = {1-exp[-(1-C)NTU]}/{1-Cexp[-(1-C)NTU]}, where C is the heat capacity ratio. If there will be condensation on one side of the heat exchanger, what will be its effectiveness?

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Hall Ticket Number :										

R-15

Code: 5GA51

III B.Tech. I Semester Supplementary Examinations May 2019

Managerial Economics and Financial Analysis

(Common to CE, ME and ECE)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. What do you understand by elasticity of demand? How do you measure its. What is its significance?

OR

2. Write elasticity demand and factors governing elasticity of demand.

UNIT–II

3. State the break even analysis? Explain objectives, importance and show the graphical representation of BEP.

OR

4. Rainbow enterprises deals in the supply of computers the following cost data available for two successive periods

	Year 1 Rs	Year 2 Rs
sales	50000	120000
Fixed costs	10000	20000
Variable cost	30000	60000

determine

a) p/v ratio 4 marks
b) breakeven point 5 marks
c) margin of safety 5 marks

UNIT–III

5. Elaborate monopoly market and price out-put determination in short run and long run.

OR

6. a) What are the causes for the emergence of monopoly?
   b) How is the equilibrium position attained by monopoly list under varying cost conditions?

UNIT–IV

7. What is working capital? Explain the factors governing working capital requirements?

OR

8. A business firm is thinking of choosing the right machines for their purpose after financial evolution of the proposals the initial cost and the net cash flow over five years to the business firm have been calculated for each machine as follows.

	Machine 1 (Rs)	Machine 2 (RS)
Initial cost	20000	28000
annual cash inflow 1year	8000	10000
2 year	12000	12000
3 year	9000	12000
4 year	7000	9000
5 year	6000	9000

Choose the machine based on i) payback period ii) accounting rate return

UNIT–V

9. From the following trial balance of xyz ltd prepare trading and profit&loss account for the year ending 31-3-2017 and balance sheet as on date considering the adjustments given below:

Debit balances	Rs	Credit balances	Rs
buildings	70000	Carriage in wards	1291
Motor trucks	12000	Reserve doubtful debts	1320
furniture	1640	Establishments expenses	2135
debtors	15600	Carriage out wards	800
creditors	18852	insurance	783
stock	15040	interest	340
Cash in hand	988	bad debts	613
Cash at bank	14534	Audit fee	400
Bills receivables	5844	General expenses	3050
purchases	85522	investments	8922
discount	945	sales	121850
Returns in word	285	capital	920000
		Bills payable	6930
		rent	900
Adjustments: 1) closing stock Rs 15000 2) depreciation on motor trucks 20% and furniture 10% per annum 3)write of bad debts of Rs100 and maintain at 5% reserve for doubtful debts 4) prepaid insurances Rs 150 5)interest accrued but not received Rs 120			

OR

10. Write Short notes on
    a) Liquidity ratios 3M
    b) Profitability ratios 4M
    c) Activity ratios 4M
    d) Capital structure ratios are illustrating suitable example. 3M

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Hall Ticket Number :										

R-15

Code: 5G553

III B.Tech. I Semester Supplementary Examinations May 2019

Machine Tools

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Classify various chips formed in metal cutting and write down their favourable conditions. 7M

   b) Discuss about ORS tool nomenclature system. 7M

OR

2. a) What are the various forces acting in turning operations? Explain their significance with neat sketch. 7M

   b) What are the functions of cutting fluid? How they are classify? 7M

UNIT–II

3. a) Explain the working of taper turning by attachment method. 7M

   b) Differentiate capstan and turret lathes. 7M

OR

4. a) A 500mm long, 60 mm diameter stainless steel bar is being reduced in diameter to 50mm in turning on lathe. The spindle rotates at 500 RPM; the tool is travelling at a speed of 10 mm/min. Calculate the (i) Cutting speed (ii) Material removal rate (iii) Cutting time. Assume no approach and over travel length and number of passes = 2. 7M

   b) Classify various types of automatic lathes and explain constructional details of Swiss type automatic machine. 7M

UNIT–III

5. a) With neat sketch explain the working of slotting machine. 7M

   b) Explain any five operations performed on drilling machine. 7M

OR

6. a) Explain the principle of milling operation. Discuss about the following Milling operations **(i)** Plain Milling **(ii)** Gang Milling. 7M

   b) Define Indexing. Explain the following Indexing methods.
   (i) Direct or Rapid Indexing **(ii)** Simple or Plain Indexing 7M

UNIT–IV

7. a) How do you classify grinding machines? Explain about Centre less grinding machine. 7M

   b) Discuss about the selection and specification of grinding wheel. 7M

8. a) Define broaching operation. What are the elements of a broach tool? 7M

   b) Classify broaching machines. Discuss about continuous broaching machine. 7M

UNIT–V

9. a) Discuss about lapping process with neat sketch. 7M

   b) Compare grinding, lapping and honing processes. 7M

OR

10. a) Outline the various principles of locating devices. 7M

    b) Sketch and explain any four work holding devices used in turning operations. 7M

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