Hall Ticket Number :										

R-15

Code: 5G551

III B.Tech. I Semester Supplementary Examinations May 2018

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) In a steam power plant operating on the Rankine cycle, steam enters the turbine at 4 Mpa, 350^0 and exits at a pressure of 15 kPa. Then it enters the condenser and exits as saturated water. Next, a pump feeds back the water to the boiler. The isentropic efficiency of the turbine is 90%. Determine **i)** Network output of the cycle **ii)** Heat supplied to the cycle is

   b) Define mean temperature of heat addition and for a given surrounding's temperature, write the effect of increase in mean temperature of heat addition on cycle efficiency?

OR

2. a) A Steam power plant operates on Ideal Reheat Rankine cycle; steam enters the high pressure turbine at 8 Mpa & 500 ^{0}C and leaves at 3 Mpa. It is now reheated at constant pressure to 500 ^{0}C, and then expands to 20 kPa in the low pressure turbine. Draw the cycle on T-s and h-s diagrams and also determine the Turbine work output and the thermal efficiency of the cycle.

   b) Compare Carnot and Rankine cycles?

UNIT–II

3. a) Describe the working of following devices with neat diagrams?
      i) Dead weight safety valve
      ii) Fusible plug

   b) Briefly explain the working of Babcock and Wilcox boiler with a neat sketch.

OR

4. a) Derive an equation for condition for maximum discharge, efficiency of chimney

   b) Discuss the advantages of mechanical draught over natural draught

UNIT–III

5. a) Steam at 20bar and 250^0C expands isentropically to a pressure of 3bar in a C-D nozzle. Calculate the mass flow per unit exit area?

   b) Classify the nozzles? And evaluate the critical pressure ratio for dry saturated steam and superheated steam?

OR

6. a) Explain the working of a steam condensing plant with a neat sketch?

   b) Explain evaporative type condenser with a neat sketch?

UNIT–IV

7. a) Explain velocity compounding in steam turbines with neat sketch.
   b) Explain about methods of Turbine Governing?

OR

8. a) In a simple impulse turbine, the nozzles are inclined at 22^0 with the direction of motion of the moving blades. The steam leaves the nozzles at 375 m/s. The blade speed is 165 m/s. Find suitable inlet and outlet angles for the blades in order that the axial thrust is zero. The relative velocity of steam as it flows over the blades is reduced by 15 % due to friction. Determine also the power developed for a flow rate of 10 kg/s.
   b) Explain velocity compounding in steam turbines with neat sketch.

UNIT–V

9. a) The outlet angle of the blade of a parson's turbine is 20^0 and the axial velocity of flow of steam is 0.5 times the mean blade velocity. If the diameter of the ring is 2.25 m and the rotational speed is 3600 rpm. Determine
      i. Inlet angle of the blade
      ii. Power developed if dry saturated steam at 5 bar passes through the blade, whose height is 6 cm. Neglect the effect of blade thickness.
   b) Define degree of reaction and draw the velocity triangles for parsons reaction turbine

OR

10. a) Define the terms
      i. Theoretical indicated diagram
      ii. Actual indicated diagram
      iii. Diagram factor
   b) Discuss briefly about Performance of steam engines

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Hall Ticket Number :										

Code: 5G554

R-15

III B.Tech. I Semester Supplementary Examinations May 2018

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) Discuss the factors to be considered for the selection of materials for the design of machine elements?

   b) Enumerate the various manufacturing methods of machine parts which a designer should know.

OR

2. a) What is factor of safety? List the factors to be considered while deciding the factor of safety.

   b) A critical section in a shaft, is subjected to a twisting moment of 20 KN-m and a bending moment of 16 KN-m. The yield strength of the shaft material is 700 MPa. Determine the diameter of shaft according to any three theories of failure. Take factor of safety=3, E=210 GPa, and Poisson's ratio = 0.25.

UNIT–II

3. a) What is stress concentration? Discuss the various methods of reducing stress concentration.

   b) Explain the following terms in connection with design of machine members subjected to variable loads:
      (i) Endurance limit
      (ii) Size factor
      (iii) Surface finish factor
      (iv) Notch sensitivity

OR

4. A shaft of diameter 'd' is subjected to a torque varying between 900 Nm to 1800 Nm. Assuming a factor of safety 2 and a stress concentration factor of 1.2, find the diameter of the shaft. Take σ_u = 650 N/mm^2, σ_y = 480 N/mm^2, Size factor B = 0.85 and surface finish factor C = 0.5.

UNIT–III

5. a) Explain the various stress induced in screwed fastening due to initial tightening.

   b) A mild steel plate of 10 mm thickness is joined to another plate by a single transverse weld and double parallel fillet welds. Find the width of the plate and length of the welds, if the joint is subjected to a direct tensile force of 50 kN. Take permissible shear stress for the weld as 80 MPa, and tensile stress as 90 MPa. The permissible tensile stress for the plate material is 60 MPa.

OR

6. a) What is an eccentric loaded welded joint? Discuss the procedure for designing such a joint.

   b) A 70 mm diameter solid shaft is to be welded to a plate by means of a fillet weld, around the circumference of the shaft. Determine the size of the weld, if the shaft is subjected to a torque of 4 kN-m. The allowable shear stress in the weld is 45 MPa.

   Instead of torque, if the above shaft is subjected to a bending moment of 4 kN-m, determine the size if the weld. The allowable normal stress in the weld is 60 MPa.

UNIT–IV

7. a) Distinguish between cotter joint and knuckle joint.

   b) It is required to design a square key for fixing a gear on a shaft of 30 mm diameter. The shaft is transmitting 20 kW power at 600 rpm to the gear. The key is made of steel 50C4 (S_{yt} = 460 N/mm^2) and the factor of safety is 4. For key material, the yield strength in compression can be assumed to be equal to the yield strength in tension. Determine the dimensions of the key.

OR

8. a) Why gibs are used in a cotter joint? Explain with the help of a neat sketch the use of single and double gib.

   b) Two rods having 30 mm x 30 mm square cross-section are connected using a gib and cotter. Calculate the leading dimensions of the joint so as to have the strength of the joint same as the strength of the rods in tension. For all the parts of the joint take the allowable stresses as follows: Tensile strength = 120 N/mm^2 shear strength = 70 N/mm^2 and compression strength = 240 N/mm^2.

UNIT–V

9. a) Describe, with the help of neat sketches, the types of various shaft couplings mentioning the use of each type.

   b) Determine the inside and outside diameters of a hollow shaft which will replace a solid shaft made of the same material and be equally as strong as solid one and also have only half the weight of solid one.

OR

10. a) A hollow shaft has greater strength and stiffness than solid shaft of equal weight. Explain.

    b) A rigid coupling is used to transmit 60 kW power at 350 rpm. There are six bolts. The outer diameter of the flanges is 250 mm, while the recess diameter is 175 mm. the coefficient of friction between the flanges is 0.15. The bolts are made of steel 45C8 (S_{yt} = 380 N/mm$^{2)}$ and the factor pf safety is 3. Determine the diameter of the bolts. Assume that the bolts are fitted in large clearance holes.

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Hall Ticket Number :										

R-15

Code: 5G552

III B.Tech. I Semester Supplementary Examinations May 2018

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) Explain the terms, friction circle, friction couple and friction axis. 6M

   b) A shaft has a number of collars integral with it. The external diameter of the collars is 400 mm and the shaft diameter is 250 mm. If the intensity of uniform pressure is 0.35 N/mm^2 and the coefficient of friction is 0.05, estimate the power absorbed when the shaft runs at 120 rpm carrying a load of 150 kN and the number of collars required. 8M

OR

2. The semi-cone angle of a cone clutch is 12.5° and the contact surfaces have a mean diameter of 80 mm, coefficient of friction is 0.32. What is the minimum torque required to produce slipping of the clutch for an axial load of 200 N? If the clutch is used to connect an electric motor with a stationary flywheel, determine the time needed to attain the full speed and the energy lost during slipping. Motor speed is 900 rpm and the moment of inertia of the flywheel is 0.4 kg-m^2. 14M

UNIT–II

3. a) The mass of the turbine rotor of a ship is 20 tonnes and has a radius of gyration of 0.60 m. Its speed is 2000 r.p.m. The ship pitches 6° above and 6° below the horizontal position. A complete oscillation takes 30 seconds and the motion is simple harmonic. Determine the following:

   i. Maximum gyroscopic couple, ii. Maximum angular acceleration of the ship during pitching, and iii. The direction in which the bow will tend to turn when rising, if the rotation of the rotor is clockwise when looking from the left. 8M

   b) What do you understand by gyroscopic couple? Derive a formula for its magnitude. 6M

OR

4. A torsion dynamometer is fitted on a turbine shaft to measure the angle of twist. It is observed that the shaft twists 2° in a length of 5 m at 600 rpm. The shaft is solid and has a diameter of 250mm. if the modulus of rigidity is 84 GPa, find the power transmitted by the turbine. 14M

UNIT–III

5. The torque delivered by a two stroke engine is represented by T= (1000 + 300sin2θ - 500cos2θ) N-m where θ is the angle turned by the crank from the IDC. The engine speed is 250rpm.The mass of the flywheel is 400kg and radius of gyration 400mm. Determine,

   (i) The power developed

   (ii) The total percentage fluctuation of speed

   (iii) The angular acceleration of flywheel when the crank has rotated through an angle of 60° from the IDC.

   (iv) The maximum angular acceleration and retardation of the flywheel. 14M

OR

6. In an engine governor of the Porter type, the upper and lower arms are 200mm and 250 mm respectively and pivoted on the axis of rotation. The mass of the central load is 15 kg, the mass of each ball is 2 kg and friction of the sleeve together with the resistance of the operating gear is equal to a load of 25 N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40°, find, taking friction into account, range of speed of the governor. 14M

UNIT–IV

7. The three cranks of a three cylinder locomotive are all on the same axle and are set at 120°. The pitch of the cylinders is 1m and the stroke of each piston is 0.6 m. The reciprocating masses are 300 kg for inside cylinder and 260 kg for each outside cylinder and the planes of rotation of the balance masses are 0.8 m from the inside crank. If 40% of the reciprocating parts are to be balanced, find :
   a. the magnitude and the position of the balancing masses required at a radius of 0.6 m; and
   b. b. the hammer blow per wheel when the axle makes 6 r.p.s. 14M

OR

8. A shaft has three eccentrics, each 75 mm diameter and 25 mm thick, machined in one piece with the shaft. The central planes of the eccentric are 60 mm apart. The distance of the centers from the axis of rotation are 12 mm, 18 mm and 12 mm and their angular positions are 120° apart. The density of metal is 7000 kg/m^3. Find the amount of out-of-balance force and couple at 600 r.p.m. If the shaft is balanced by adding two masses at a radius 75 mm and at distances of 100 mm from the central plane of the middle eccentric, find the amount of the masses and their angular positions. 14M

UNIT–V

9. a) A shaft 1.5 m long, supported in flexible bearings at the ends carries two wheels each of 50 kg mass. One wheel is situated at the center of the shaft and the other at a distance of 375 mm from the center towards left. The shaft is hollow of external diameter 75 mm and internal diameter 40 mm. The density of the shaft material is 7700 kg/m^3 and its modulus of elasticity is 200 GN/m^2. Find the lowest whirling speed of the shaft, taking into account the mass of the shaft. 10M

   b) Explain the term ‘dynamic magnifier’ and write the expression for ‘Magnification factor’. 4M

OR

10. a) An electric motor rotating at 1500 r.p.m. drives a centrifugal pump at 500 r.p.m. through a single stage reduction gearing. The moments of inertia of the electric motor and the pump impeller are 400 kg-m^2 and 1400 kg-m^2 respectively. The motor shaft is 45 mm in diameter and 180 mm long. The pump shaft is 90mm in diameter and 450mm long. Determine the frequency of torsional oscillations of the system, neglecting the inertia of the gears. The modulus of rigidity for the shaft material is 84 GN/m^2. 10M

    b) What do you mean by whirling of shafts? What is whirling or critical speed? Explain. 4M

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Hall Ticket Number :										

Code: 5G555

R-15

III B.Tech. I Semester Supplementary Examinations May 2018

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) Generate expression for temperature distribution, under 1D steady state heat conduction for sphere system.

   b) Why is the thermal conductivity of a solid generally larger than that of a liquid? Why is the thermal conductivity of a liquid larger than that of a gas? Why does the thermal conductivity of a gas increase with increasing temperature?

OR

2. a) The 5-mm-thick bottom of a 200-mm-diameter pan may be made from aluminum (240 W/mk) or copper (390 W/m K). When used to boil water, the surface of the bottom exposed to the water is nominally at 110_C. If heat is transferred from the stove to the pan at a rate of 600 W, what is the temperature of the surface in contact with the stove for each of the two materials?

   b) What is a contact resistance? How is it defined? How is the contact resistance affected by the roughness of adjoining surfaces? If the air in the contact region between two surfaces is replaced by helium, how is the thermal contact resistance affected?

UNIT–II

3. a) A furnace wall consists of 200mm layer of refractory bricks, 6mm layer of steel plate and a 100mm layer of insulation bricks. The maximum temperature of the wall is 1150°C on the furnace side and the minimum temperature is 40 $^{\circ}$C on the outermost side of the wall. An accurate energy balance over the furnace shows the heat loss from the wall is 400 W/m^2. It is known that there is a thin layer of air between the layer of refractory bricks and steel plate. Thermal conductivities for the three layers are 1.52,45 and 0.138 W/m$^{\circ}$c respectively. Find

      i. To how many millimeters of insulation brick in the air layer equivalent?
      ii. What is the temperature of the outer surface of the steel plate?

   b) Generate an expression for heat dissipation and temperature distribution in straight fin of rectangular profile for the case fin insulated at tip.

OR

4. A long cylinder of 30-mm diameter, initially at a uniform temperature of 1000 K, is suddenly quenched in a large, constant-temperature oil bath at 350 K. The cylinder properties are 1.7 W/m K, c_p1600 J/kg K, and density 400 kg/m^3, while the convection coefficient is 50 W/m^2 K.

   a. Calculate the time required for the surface of the cylinder to reach 500 K.
   b. Compute and plot the surface temperature history for time 300 s. If the oil were agitated, providing a convection coefficient of 250 W/m^2 K, how would the temperature history change? What is the physical interpretation of the Fourier number and Biot number?

UNIT–III

5. a) Generate momentum and energy equation for laminar free convection heat transfer on a vertical flat plate.

   b) Two horizontal panels separated by a distance of 30mm contain air at atmospheric pressure. The temperatures of the lower and upper panels are 55˚C and 20.6˚C respectively. Calculate the free convection heat transfer per m^3 of the panel surface.

OR

6. a) A tube 5 m long is maintained at 100˚C by the steam jacketing. A fluid flows through the tube at the rate of 175kg/h at 30˚C.The diameter of the tube is 2 cm. Find out average heat transfer coefficient.

   Take the following property-Density=850kg/m3, Cp=2000 J/kg˚C,

   Kinematic Viscosity=$5.1*10^{-6}$ m^2/sec, K=0.12W/m˚C

   b) How does the velocity boundary layer thickness vary with distance from the leading edge for laminar flow over a flat plate? For turbulent flow?

UNIT–IV

7. a) Vertical flat plate in the form of fin is 600m in the height and exposed to steam at the atmospheric pressure. If surface of the plate is maintain at 60˚C,Calculate the following-

   i. The film thickness at the trailing edge of the film.
   ii. The overall heat transfer coefficient.
   iii. The heat transfer rate.
   iv. The condensate mass flow rate

   b) How does drop-wise condensation differ from film condensation? Which mode of condensation is characterized by larger heat transfer rates?

OR

8. a) The large parallel planes with the emissivity's 0.3 and 0.8 exchange heat. Find the percentage reduction when a polished aluminum shield of emissivity 0.04 is placed between them. Use the method of electrical analogy.

   b) What is Stefan-Boltzmann law? How would you determine total intensity of radiation emitted by blackbody at a prescribed temperature?

UNIT–V

9. a) Generate expression for effectiveness by NTU method for the counter flow heat exchanger.

   b) In a certain double pipe heat exchanger hot water flows at a rate of 5000 kg/h and cooled from 95˚C to 65 ˚C. At the same time 50000 kg/h of the cooling water at the 30 ˚C enters the heat exchanger. The flow conditions are such that overall heat transfer coefficient remains constant at 2270 W/m^2K.determine the heat transfer area required and the effectiveness. Assuming two streams are in parallels flow. Assume for the both the streams Cp=4.2kJ/kgK.

OR

10. a) What is effectiveness of heat exchanger? List its range of possible values. What is number of transfer units? List its range of possible values?

    b) A chemical having specific heat of 3.3kJ/kg K flowing at the rate of 20000kg/h enters a parallel flow heat exchanger at 120˚C.the flow rate of the Cooling water is 50000kg/h with an inlet temperature of 20˚C.The heat transfer area is 10m^2 and the overall heat transfer coefficient is 1050 W/m^2K.

    i. The effectiveness of the heat exchanger.
    ii. The outlet temperature of the water and chemical.

    Take for water specific heat=4.186 kJ/kg K.

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Hall Ticket Number :										

Code: 5GA51

R-15

III B.Tech. I Semester Supplementary Examinations May 2018

Managerial Economics and Financial Analysis

(Common to CE, ME & 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. Define Price elasticity, Income elasticity and Cross price elasticity of demand. What are the different methods of measuring Price Elasticity of demand? Derive relationship between Price Elasticity of Demand and Marginal Revenue?

OR

2. Define Managerial Economics. Discuss the nature and scope of Managerial Economics. What is the relationship of Managerial Economics with Microeconomics?

UNIT-II

3. What is the shape of long-run average cost curve and explain why? Differentiate between Economies of Scale and Economies of Scope with suitable examples.

OR

4. Define and show graphically the Break even point of a firm. Find out the break even output (Q*) of a firm if total cost (TC) = Rs. 6310; total revenue (TR) = Rs. 4130; fixed cost (FC) = Rs. 4980; variable cost (VC) = Rs. 1330 and present output (Q) = 5.

UNIT-III

5. Compare and Contrast the Short-run and Long-run equilibrium conditions under Perfect competition and Monopoly market.

OR

6. Define Oligopoly market structure. Describe how price and output is determined under Stackelberg Duopoly model.

UNIT-IV

7. Why is capital important for a firm? What are the various sources of raising capital? Elaborate.

OR

8. What is capital budgeting? Define Net Present Value and Discount Rate. Write a brief note on Pay Back Method.

UNIT-V

9. What do you understand by the term ‘Ledger’ and ‘Trial Balance’? Name two methods of preparing a Trial Balance. Prepare a purchase book from the following information:
   a) Purchase of goods costing Rs. 5000/- from M/s Ramesh & Co. vide invoice no. 120 dated 15/09/2017.
   b) Purchase of Fixed Assets costing Rs. 8000/- from M/s Renu & Co. vide invoice no. 016 dated 20/09/2017.
   c) Paid wages of Rs. 600/- in cash vide receipt no.16 dated 25/09/2017.

OR

10. What is the meaning of Accounting Ratios? What are the objectives of ratio analysis? List out the advantages and limitations of ratio analysis.

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Hall Ticket Number :										

R-15

Code: 5G553

III B.Tech. I Semester Supplementary Examinations May 2018

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) Derive the expressions for chip reduction coefficient in single point cutting tool. State the assumptions made. 7M

   b) Derive the formula for stress developed in shearing zone for orthogonal cutting. 7M

OR

2. a) Draw a neat diagram of an engine lathe. Describe and mark its parts 7M

   b) Interpret on what factors the selection of tool type depends. 7M

UNIT–II

3. a) List any four operations that can be performed on a lathe and explain them briefly 7M

   b) Why is the turret lathe well suited to repetitive manufacture of complex cylindrical parts? Justify 7M

OR

4. Illustrate the method of machining taper turning on a lathe machine by special taper attachment method. 14M

UNIT–III

5. a) Explain briefly the construction of a radial drilling machine labeling its parts. 7M

   b) Discuss in detail the working a planning machine. 7M

OR

6. a) Define and discuss tapping process on a drilling machine. 7M

   b) Appraise the role, functions of coolants in a grinding process, and suggest suitable coolant used for grinding. 7M

UNIT–IV

7. a) Identify and narrate the process of horizontal pull type broaching machine. 7M

   b) Outline the process of super finishing. 7M

OR

8. a) Predict at least one micro finishing method and explain it in detail. 7M

   b) Identify the basis for selection of a grinding wheel based on a specific applications 7M

UNIT–V

9. a) State the basic rules of location. 7M

   b) List and discuss the various types of drilling jigs. 7M

OR

10. a) Sketch and describe the working of a honing tool? 7M

    b) Summarize in detail theoretically the principle of six point location. 7M

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