Hall Ticket Number :										

R-14

Code: 4G551

III B.Tech. I Semester Supplementary Examinations May 2017

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 the Rankine cycle on P-V and T-S diagrams using dry saturated steam and obtain an expression for the Rankine cycle efficiency? 7M

   b) Steam at 50 bar, 400^0 C expands in a Rankine cycle to 0.34 bar. For a mass flow rate of 150 kg/s of steam, Determine:
   i) power developed **ii)** thermal efficiency **iii)** specific steam consumption. 7M

OR

2. a) Describe briefly the Rankine cycle using super-heated steam and show in what respect it is different from the carnot cycle between the same temperatures? 7M

   b) In a Rankine cycle, the maximum pressure of steam supplied is 6 bar. The dryness fraction is 0.9. The exhaust pressure is 0.7 bar. Find the theoretical work done and Rankine cycle efficiency. 7M

UNIT–II

3. a) Explain the working principle of a locomotive boiler with a neat sketch? 7M

   b) A chimney 30 meters high is full of hot gasses at a temperature of 307^0C. The air required for the complete combustion of 1 kg of fuel is 18 kg. If the atmosphere temperature is 27^0C. Find the draught **i)** in terms of water column **ii)** in terms of column of hot gasses. 7M

OR

4. a) Explain the working principle of a Benson boiler with a neat sketch? 7M

   b) A 30 meter high chimney is used to produce a natural draught of 15 mm of water. The temperature of the hot gasses inside the chimney is 287^0 C and the outside air is 27^0 C. Find the mass of air used per kg of fuel. 7M

UNIT–III

5. a) Describe with a neat sketch explain the working principle of a surface condenser. Compare the merits and demerits over jet condenser. 7M

   b) Dry saturated steam at a pressure of 8 bar enters a convergent-Divergent nozzle and leaves it at a pressure of 1.5 bar, If the flow is isentropic, and the corresponding expansion index is 1.135, find the ratio of cross sectional area at exit and throat for maximum discharge. 7M

OR

6. a) Explain the metastable flow of steam through a nozzle and the significance of Wilson's line with a neat diagram. 7M

   b) Dry saturated steam enters a nozzle at a pressure of 10 bar and with an initial velocity of 90 m/s. The outlet pressure is 6 bar and the outlet velocity is 435 m/s. The heat loss from the nozzle is 9 KJ/kg of steam flow. Calculate the dryness fraction and the area of the exit, if the area at the inlet is 1256 mm^2. 7M

UNIT–IV

7. a) Discuss the method of velocity compounding of an impulse turbine with a neat sketch. 7M

   b) A two row Curtis wheel operates at blade speed of 150 m/s, when receiving 3 kg of steam per second at 10.5 bar dry and saturated. The ratio of blade speed to the steam speed at exit from the nozzle is 0.21 and the nozzle efficiency is 90%. The nozzles are inclined at 16^0 to the plane of the wheel. The outlet angles of the first row moving, fixed and second row of moving blades are 20^0, 24^0 and 32^0 respectively with respective blade coefficients as 0.79, 0.83 and 0.88. Determine: **i)** pressure of steam at exhaust **ii)** Diagram efficiency **iii)** Stage efficiency. 7M

OR

8. a) Derive the condition for maximum efficiency of a Reaction and impulse turbine with a neat sketch. 7M

   b) A velocity compounded impulse turbine has two rows of moving blades with a fixed row of guide blades. The steam leaves the nozzle at 900 m/s in a direction of 18^0 to the plane of rotation. The blade speed is 150 m/s and the blade outlet angles are 24^0, 26^0 and 30^0 for the first moving, first fixed and second moving respectively. The friction factor is 0.9 for all rows. The steam supply is 4500 kg/hr. Determine: **i)** Tangential force on the rotor **ii)** Total work done on the blades and **iii)** power developed by the turbine. 7M

UNIT–V

9. a) Discuss briefly the methods of governing a simple steam engine. 7M

   b) A Throttled governed steam engine requires 500 kg of steam per hour while developing 37.5 KW and 2000 kg/hr when developing 187.5 KW. Find the thermal efficiency of the engine when it develops 115 KW assuming the steam supplied to dry saturated at a pressure of 15 bar and exhaust pressure to be 0.3 bar. 7M

OR

10. a) Define missing quantity. Discuss the method to find out with a neat sketch. 7M

    b) A reciprocating steam engine, governed by throttling, uses 530 kg of steam/hr, when developing 55 KW I.P. It uses 2160 kg/hr when developing 280 KW I.P. Find the approximate power of this engine when the steam consumption is 1580 kg/hr, assuming William's relation holds good. 7M

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Hall Ticket Number :										

R-14

Code: 4G554

III B.Tech. I Semester Supplementary Examinations May 2017

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) How do you classify the materials for engineering use? Explain. 7M

   b) Explain various manufacturing considerations in design. 7M

OR

2. a) Discuss the following

      i) Maximum Principal strain theory

      ii) Distortion Energy theory 7M

   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 6kN. Calculate factor of safety according to

      i) Max. Normal stress Theory

      ii) Max. Shear Stress Theory.

      Assume yield strength of the shaft material as 400MPa. 7M

UNIT–II

3. a) What is endurance strength? 2M

   b) A pulley is keyed to a shaft mid-way between two anti-fraction bearings the bending moment at the pulley varies form -170N-m to 510N-m, as the torsional moment varies from 55N-m to 165N-m. The variation of the load is as that of the shaft speed. The shaft is made of cold drawn steel having an ultimate strength of 538MP and yield strength of 400MPa. Determine the diameter for an infinite life. The stress concentration factor for the key way in bending and torsion may be taken as 1.6 and 1.3 respectively. Correction factors A= 1 for bending and A=0.6 for torsion, B= 0.85, C=0.88. use factor of safety as 2. 12M

OR

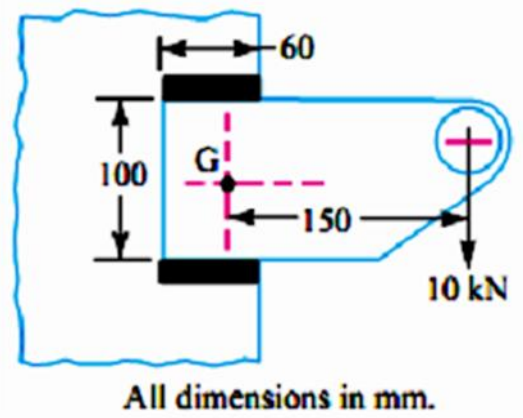
4. a) Describe Goodman's criteria. 7M

   b) A Connecting rod of a steam engine is subjected to an axial load of 75kN which I completely reversed. Determine the required diameter of rod using a factor of safety 2.5. For material of the rod yield strength: 310MPa, ultimate strength: 580MPa, K_{sur}: 0.78, K_{sz}: 0.81. 7M

UNIT–III

5. a) List various types of welded joints. 2M

   b) A bracket, as shown in Fig. carries a load of 10 kN. Find the size of the weld if the allowable shear stress is not to exceed 80 MPa.



12M

OR

6. a) What are the advantages of riveted joints? 2M

   b) A triple riveted lap joint with zig-zag riveting is to be designed to connect two plates of 6 mm thickness. Determine the dia. of rivet, pitch of rivets and distance between the rows of rivet. Indicate how the joint will fail. Assume: σ_t = 120 MPa ; τ = 100 MPa and σ_c = 150 MPa. 12M

UNIT–IV

7. a) What is the function of a Cotter Joint? 2M

   b) Describe the design procedure of Gib and Cotter joint. 12M

OR

8. Design a Knuckle joint to connect two tension rods to carry a load of 25kN. Take Tensile strength: 80MPa, shear strength: 50MPa. 14M

UNIT–V

9. a) What is the function of coupling? 2M

   b) Design a cast-iron flange coupling to connect two shafts in order to transmit 7.5kWat 720rpm. The following permissible stresses are given below.

   Permissible shear stress for shaft, bolt and key material is 33MPa.

   permissible crushing stresses for bolt and key material 60MPa, permissible shear stress for cast-iron is 15MPa 12M

OR

10. a) Define terms

    (i) Equivalent bending moment

    (ii) Equivalent twisting moment 2M

    b) A hollow shaft of 0.5m outside diameter and 0.3m inside diameter is used to drive a propeller of a marine vessel. The shat is mounted on bearings 6m apart and transmits 5600kW at 150 rpm. The maximum axial propeller thrust is 500kN and the shaft weighs 70kN. Determine the maximum shear stress induced in the shaft. 12M

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Hall Ticket Number :										

Code: 4G552 **R-14**

III B.Tech. I Semester Supplementary Examinations May 2017

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) Define the terms coefficient of friction and limiting angle of frictions? 4M

   b) A plain collar type thrust bearing having inner and outer diameters of 200mm and 450 mm is subjected to an axial thrust 40 KN. Assuming coefficient of friction between the thrust surfaces as 0.025, find the power absorbed in overcoming friction at a speed of 120 rpm. The rate of wear is considered to be proportional to the pressure and rubbing speed? 10M

OR

2. a) Write a short note on centrifugal clutch? 4M

   b) A multiple disc clutch has 6 active friction surfaces. The power transmitted is 20KW at 400 rpm. Inner and outer radii of the friction surface are 90 and 120mm respectively. Assuming uniform wear with a coefficient of friction 0.3 Find the maximum axial intensity of pressure between the discs? 10M

UNIT–II

3. a) What are the varies types of brakes? 4M

   b) How do you classify dynamometers? Describe any one dynamometer with the help of sketch? 10M

OR

4. a) What do you mean by gyroscopic couple? 2M

   b) Each road wheel of a motorcycle is of 600 mm diameter and has a moment of inertia of 1.1 kg.m^2. The motorcycle and the rider together weigh 220 kg and the combined centre of mass is 620mm above the ground level when the motorcycle is upright. The moment of inertia of the rotating parts of the engine is 0.18 kg-m^2. The engine rotates at 4.5 times the speed of road wheels in the same sense. Find the angle of heel necessary when the motor-cycle is taking a turn of 35m radius at a speed of 72 km/h. 12M

UNIT–III

5. a) What are Turning–moment diagrams? Why are they drawn? 4M

   b) Find a relation for the coefficient of fluctuation of speed in terms of maximum fluctuation of energy and the kinetic energy of the flywheel at mean speed? 10M

OR

6. a) How do you classify governors? 2M

   b) The following particulars refer to a proell governor with open arms.

   Length of all arms = 200mm. Distance of pivot arms from the axis of rotation 40mm. Length of extension of lower arms to which each ball is attached = 100mm. mass of each ball 6kg. mass of central load 150 kg. radius of rotation of balls 180mm. when the arms inclined at an angle 40^0 to the axis of rotation. Find the equilibrium speed for each above configuration. 12M

UNIT–IV

7. a) Explain the method of balancing of different masses revolving in the different planes? 6M

   b) Four masses m_1 m_2, m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m. 8M

OR

8. a) What do you mean by hammer blow? 2M

   b) A single cylinder reciprocating engine has speed 240 r.p.m., stroke 300 mm, mass of reciprocating parts 50 kg, mass of revolving parts at 150 mm radius 37 kg. If two-third of the reciprocating parts and all the revolving parts are to be balanced, find: 1. The balance mass required at a radius of 400 mm, and 2. The residual unbalanced force when the crank has rotated 60° from top dead centre. 12M

UNIT–V

9. a) What are free, damped and forced vibrations? Explain. 6M

   b) A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus for the shaft material is 200 GN/m^2. Determine the frequency of longitudinal and transverse vibrations of the shaft. 8M

OR

10. a) Distinguish between longitudinal, transverse and torsional vibrations? 4M

    b) A flywheel is mounted on a vertical shaft as shown in Fig 24.2. The both ends of a shaft are fixed and its diameter is 50 mm. The flywheel has a mass of 500 kg and its radius of gyration is 0.5 m. Find the natural frequency of torsional vibrations, if the modulus of rigidity for the shaft material is 80 GN/m. 10M

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Hall Ticket Number :										

Code: 4G555 **R-14**

III B.Tech. I Semester Supplementary Examinations May 2017

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) Explain the role of variable thermal conductivity with the help of equations.

   b) Temperature variation in a slab is given by: $T(x)=100+200x-500x^2$, where x is in meters; x=0 at the left face and x= 0.3m at the right face. Thermal conductivity of the material k=45W/(mC). Also c_p=4 kJ/(kgK) and ρ=1600 kg/m^3. Determine:

   i. Temperature at both surfaces

   ii. Heat transfer at left face and its direction

   iii. Heat transfer at right face and its direction.

   iv. Is there any heat generation in the slab? If so, how much?

   v. Maximum temperature in the slab and its location.

   vi. Time rate of change of temperature at X=0.1m if the heat generation rate is suddenly doubled.

   vii. Draw the temperature profile in the slab.

   viii. Average temperature of the slab.

OR

2. a) Explain the concept of thermal resistance and thermal contact resistance.

   b) A hollow cylinder of inner radius r1 and outer radius r2 has temperature variation along the radius gives by T(r)=400-400. In (r/r1). Thermal conductivity of the material, k=45W/(mC). If r1=5cm and r2=10cm, determine the direction and rate of flow of heat at the two surfaces for 1m length of pipe.

UNIT–II

3. a) Derive the equation for heat transfer at critical valve of thickness for cylindrical pipe.

   b) A refrigerant suction line of 25mm OD is to be insulated using a material of thermal conductivity k=0.25W/(mK). The surface heat transfer coefficient h_a is 10W/(m^{2}K). Verify if the insulation is effective or not. What should be the maximum value of thermal conductivity of insulation to reduce the heat transfer?

OR

4. a) Explain the construction of Hiestler charts and significance.

   b) A long, 15cm diameter cylindrical shaft made of stainless steel 304(k=14.9 W/(mC), ρ=7900kg/m^3, Cp=477 J/kgC, and α=3.95 x 10^{-6}m^2/s), comes out an oven at an uniform temperature of 450^{0}C. The shaft is then allowed to cool slowly in a chamber at 150^{0}C with an average heat transfer coefficient of 85W/m^{2}C,

   (i) Determine the temperature at the centre of the shaft 25 min after the start of the cooling process

   (ii) Determine the surface temperature at that time, and

   (iii) Determine the heat transfer per unit length of the shaft during this time period

UNIT–III

5. a) Draw the temperature and velocity profiles for a flow over flat plate and indicate significant parameters.

   b) Derive the governing equation for forced convection using Buckingham π-theorem.

OR

6. a) Obtain the relations and temperature profile for horizontal late with constant heat flux.

   b) A horizontal metal plate, 0.5m x 0.5m, is exposed to sun and receives radiant energy at the rate 180 W/m^2. If the heat transfer from the plate occurs to the surrounding air at 20^{0}C by free convection only, find the steady state temperature of the plate. Assume that the bottom of the plate is insulated.

UNIT–IV

7. a) Derive the equation for condensation heat transfer for flat vertical plate (Nusselt's theory)

   b) A steam condenser consists of a square array of 400 horizontal tubes, each 6mm in diameter. The tubes are exposed to exhaust steam arriving from the turbine at a pressure of 0.1 bar. If the tube surface temperature is maintained at a temperature of 25^0C by circulating cold water through the tubes, determine the heat transfer coefficient and the rate at which the steam is condensed per unit length of tubes for the entire array. Assume laminar film condensation and that there are no condensable gases mixed with steam.

OR

8. a) Derive the equation for radiation shape factor for two parallel plates exposed to radiation.

   b) Two large parallel planes facing each other and having emissivities 0.3 and 0.5 are maintained at 827^0C and 527^0C, respectively. Determine the rate at which heat is exchanged between the two surfaces by radiation. If a radiation shield of emissivity 0.05 on both sides is placed parallel between the two surfaces, determine the percentage reduction in the radiant heat exchange rate.

UNIT–V

9. a) Derive the equation for LMTD for an Evaporator.

   b) In a shell and tube heat exchanger, tubes are 4m long, 3.1 cm OD, 2.7 cm ID. Water is heated from 22^0C to 45^0C by condensing steam at 100^0C on the outside of tubes. Water flow rate through the tubes is 10 kg/s. Heat transfer coefficient on steam side is 5500 W/(m^2K) and on waterside, 850 W/(m^2K). Neglecting all other resistances, find the number of tubes.

OR

10. a) Derive NTU-Effectiveness relation for parallel flow heat exchanger.

    b) A steam condenser, condensing at 70^0C has to have a capacity of 100 kW. Water at 20^0C is used and the outlet water temperature is limited to 45^0C. If the overall heat transfer coefficient is 3100 W/m^2K, determine the area required.(b) If he inlet water temperature is increased to 30^0C, determine the increased flow rate of water to maintain the same outlet temperature.

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Hall Ticket Number :										

R-14

Code: 4G553

III B.Tech. I Semester Supplementary Examinations May 2017

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. Derive the expression for shear angle in orthogonal cutting in terms of rake angle and chip thickness ratio 14M

OR

2. Explain the condition that promote the formation of the following chips.
   a) Continuous chips
   b) Continuous chips with built up edge
   c) Discontinuous chip 14M

UNIT-II

3. How is a lathe specified? Explain with a neat sketch the constructional features of a Centre lathe 14M

OR

4 What is the importance of tool layout in automats? Explain with an example for any one type, with a Component sketch 14M

UNIT-III

5. Describe the operation of quick return motion in a mechanical shaper with a neat sketch 14M

OR

6. Describe the application and relative merits of various types of milling cutters used in milling cutters 14M

UNIT-IV

7. a) Write short notes on
      i. Dressing
      ii. Truing 4M
   b) Explain static balancing of grinding wheel 10M

OR

8. a) What are the advantages and limitations of using Centre less grinding? 6M
   b) Draw the typical construction of a pull broach 8M

UNIT-V

9. a) How does lapping and honing differs from grinding 6M
   b) Explain lapping operation for flat and cylindrical work pieces with neat sketch 8M

OR

10. Explain with neat sketch the common varieties of jigs used for hole - making operations 14M

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Hall Ticket Number :										

R-14

Code: 4GA51

III B.Tech. I Semester Supplementary Examinations May 2017

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 is Managerial Economics? Discuss its relation with other areas of Management?

OR

2. Explain various Demand forecasting techniques with suitable examples?

UNIT–II

3. Define Production function? Explain about Cobb-Douglas production function?

OR

4. Explain Law of variable proportions with a suitable diagram?

UNIT–III

5. How do you classify markets? Discuss price output determination in monopoly market?

OR

6. What is the need of Public Sector business organizations? Explain various public sector organizations in detail?

UNIT–IV

7. Define Capital? Explain its types and significance?

OR

8. What is Capital budgeting? Discuss various methods of capital budgeting?

UNIT–V

9 What is Trail balance? Explain its role and importance in financial accounting?

OR

10. What is Ratio Analysis? Discuss various financial ratios in financial analysis?

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