Hall Ticket Number :										

R-11 / R-13

Code: 1G555

III B.Tech. I Semester Supplementary Examinations May 2019

Heat Transfer

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) What is Fourier's law of conduction? State also the assumptions on which law is based.

   b) Derive the three-dimensional general heat conduction equation in Cartesian Coordinate. Deduce the Laplace equation from it.

2. An electrical wire of 10 m length and 1 mm diameter dissipate 200 W in air at 25^0C. The convection heat transfer co-efficient between the wire surface and air is 15W/m^2K. The thermal conductivity of wire is 0.582 W/mk. Calculate the critical radius of insulation and also determine the temperature of wire if it is insulated to the critical thickness of insulation.

3. a) Derive temperature distribution equation for a lumped system in terms of Fourier and Biot numbers.

   b) A mild steel sphere of 15 mm diameter is planned to be cooled by an air flow at 20^0C. The convective heat transfer co-efficient is 110 W/m^2K. Calculate the following: Time required to cool the sphere from 700^0C to 150^0C, instantaneous heat transfer rate 150^0C and total energy transferred up to 150^0C. Take mild steel p = 7850 kg/m^3, C_p = 474J/kg k, α = 0.044 m^2/h and k=43W/mk.

4. a) List out the importance of 5 non-dimensional numbers used in convection, with their mathematical expression.

   b) Derive the general form of Continuity and Momentum equation for convective heat transfer mechanism.

5. Atmospheric air at 275 k and a free stream velocity of 20 m/s flows over a flat plate 1.5 m long that is maintained at a uniform temperature of 325 k. calculate the average heat transfer coefficient over the region where the boundary layer thickness is laminar, the average heat transfer coefficient over entire length of the plate and the total heat transfer rate from the plate to the air over the length 1.5 m and width 1 m. assume transition occurs at $Re_c = 2X10^5$.

6. a) What is boiling? What mechanisms are responsible for the very high heat transfer coefficients in nucleate boiling?

   b) Water at atmospheric pressure is to be boiled in polished copper pan. The diameter of the pan is 380 mm and is kept at 115^0C. calculate the following:

      i. Power required to boil the water
      ii. Rate of evaporation
      iii. Critical heat flux

7. 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 95^0C to 65^0C. At the same time 50000 kg/h of the cooling water at the 30^0C enters the heat exchanger. The flow conditions are such that overall heat transfer coefficient remains constant at 2270 W/m2K.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.

8. 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 95^0C to 65^0C. At the same time 50000 kg/h of the cooling water at the 30^0C enters the heat exchanger. The flow conditions are such that overall heat transfer coefficient remains constant at 2270 W/m2K.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.

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Hall Ticket Number :										

R-11 / R-13

Code: 1G553

III B.Tech. I Semester Supplementary Examinations May 2019

Machine Tools

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) What is meant by orthogonal cutting and oblique cutting?
   b) Discuss important properties of cutting tool.

2. a) Draw a neat diagram of an engine lathe. Describe and mark its parts
   b) Explain different types of lathe operations

3. a) Explain the basic operations that are done on a shaper
   b) Explain quick return mechanism used in shaping machine

4. a) List out various operations performed in a drilling machine with simple sketches
   b) Explain the working of fine boring machine. What are its applications?

5. a) What in slab cutters? Explain
   b) With neat sketch, Explain the various types of milling operations?
      i) Face Mill ii) Peripheral milling

6. a) Write short notes on abrasive types & usage
   b) Write short notes on types of bond & designation of grinding wheel

7. a) Compare honing and lapping
   b) With help of neat sketch, disuses the working of a continuous surface broaching machine

8. a) Explain the three types of locators used in fixtures
   b) Explain jigs and fixtures

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Hall Ticket Number :										

R-11 / R-13

Code: 1G554

III B.Tech. I Semester Supplementary Examinations May 2019

Design of Machine Elements-I

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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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

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

   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 8M
      i) Maximum normal stress theory and
      ii) Maximum shear stress theory

      Assume yield strength of the shaft material as 400MPa

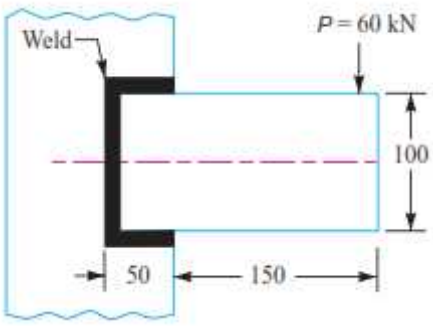
3. a) What is stress concentration? Give three examples with sketches how to minimize the stress concentration. 7M

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

4. a) Explain caulking and fullering with respect to the riveted joints. 6M

   b) Sketch and describe: (i) Single riveted lap joint. (ii) Double riveted lap joint. (iii) Double riveted butt joint with double straps. (iv) Triple riveted butt joint with double straps of unequal width. 8M

5. 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



6. 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. 14M

7. 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

8. 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-11 / R-13

Code: 1G552

III B.Tech. I Semester Supplementary Examinations May 2019

Dynamics of Machinery

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions
All Questions carry equal marks (**14 Marks** each)

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1. a) Define gyroscopic couple? 2M

   b) An aeroplane makes a complete half circle of 60 m radius to the left when flying at 200kmph. The rotary engine and propeller of the aeroplane weigh 4000 N with a radius of gyration 30 cm and engine runs at 2500 rpm clockwise, when viewed from rear end. Find the gyroscopic couple on the aeroplane and state its effect on it. Show the gyroscopic effect by a sketch 12M

2. a) Explain the following: (i) Limiting angle of friction. (ii) Angle of repose 6M

   b) Derive an expression for the horizontal force 'F', necessary to move a load 'W' up a plane, which is inclined at an angle 'a' to the horizontal 8M

3. a) Explain function of absorption type dynamometer. 6M

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

4. a) What is the function of a flywheel? How does it differ from that of a governor? 4M

   b) The torque exerted on the crank shaft of a two-stroke engine is given by the equation: T (N-m) = 14 500 + 2300 sin 2θ − 1900 cos 2θ where θ is the crank angle displacement from the inner dead centre. Assuming the resisting torque to be constant, determine: 1. The power of the engine when the speed is 150 r.p.m;

   2. The moment of inertia of the flywheel if the speed variation is not to exceed ± 0.5% of the mean speed; and 3. The angular acceleration of the flywheel when the crank has turned through 30° from the inner dead centre 10M

5. In a Porter governor, the upper and lower arms are each 30cm long. Each ball weighs 2.5 kg and the central load is 25 kg. For the lowest and highest of the sleeve the arms are inclined at 30^0 and 40^0 respectively to the vertical. The friction at the governor spindle and the mechanism connecting it to the valve is equivalent to a force of 2.5 kg at the sleeve. Assuming the links intersect on the axis, find:

   i). The travel of the sleeve ii). The minimum ascending speed

   iii). The maximum descending speed iv). Range of speed of the governor 14M

6. a) Discuss how a single revolving mass is balanced by two masses revolving in different planes. 8M

   b) Explain clearly the terms 'static balancing' and 'dynamic balancing'. State the necessary conditions to achieve them. 6M

7. Derive the following expressions, for an uncoupled two-cylinder locomotive engine: (a)Variation in tractive force (b) Swaying couple (c) Hammer blow

8. a) What do you understand by 'Torsionally equivalent shaft'? 4M

   b) The moment of inertia of a three-rotor system A, B, and C are respectively 100, 225 and 20 kg-m^2. The distance between A and B is 100 cm and between B and C is 14.1 cm and the shaft are 8 cm diameter. If the modulus of rigidity of the shaft is 80 GN/ m^2, find the frequencies of the free torsional vibration of the system. 10M

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