Hall Ticket Number :										

R-11 / R-13

Code: 1G554

III B.Tech. I Semester Supplementary Examinations November 2018

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) 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.

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.

3. 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.

4. a) What are the advantages and disadvantages of riveted joints?

   b) A triple riveted lap joint is to be made between 6.5 mm plates. The allowable stresses are 35 N/mm^2 in tensile, 29 N/mm^2 in shear, and 52.5 N/mm^2 in compression. Calculate the rivet diameter, rivet pitch and back pitch, zig-zag riveting is to be used. Indicate how the joint will fail.

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.

6. Sketch and explain the design procedure for a Knuckle joint.

7. A shaft is transmitting 15 kW at 1440 rpm. Simultaneously the shaft is subjected to a bending moment of 2 kN-m and an axial tensile load of 1 kN. The shock and fatigue factors in bending and torsion are 2.0 and 1.5 respectively. Calculate the diameter of the shaft if the maximum shear stress is not to exceed 40 MPa.

8. 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-11 / R-13

Code: 1G552

III B.Tech. I Semester Supplementary Examinations November 2018

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. The mass of the turbine rotor of a ship is 8 tonnes and the radius of gyration 0.6 m. It rotates at 1800 rpm clockwise when viewed from stern. Determine the gyroscopic effects in the following cases i) If the ship travelling at 100 kmph steers to the starboard side in a curve of 75 m radius. ii) If the ship is pitching and the bow is descending with maximum velocity, the periodic time is being 20 seconds and the total angular movement between the extreme positions is 100.

2. a) State the laws of static and dynamic friction.

   b) A conical pivot bearing supports a vertical shaft of 200 mm diameter. It is subjected to a load of 30 kN. The angle of the cone is 120° and the coefficient of friction is 0.025. Find the power lost in friction when the speed is 140 r.p.m. assuming. (i) Uniform pressure and (ii) Uniform wear

3. a) A single plate clutch, with both sides effective, has outer and inner diameters 300 mm and 200 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm^2. If the coefficient of friction is 0.3, determine the power transmitted by a clutch at a speed 2500 r.p.m.

   b) Describe with the help of a neat sketch the working principles of an internal expanding shoe. Derive the expression for the breaking torque

4. A shaft fitted with a flywheel rotates at 250 r.p.m. and drives a machine. The torque of machine varies in a cyclic manner over a period of 3 revolutions. The torque rises from 750 N-m to 3000 N-m uniformly during 1/2 revolution and remains constant for the following revolution. It then falls uniformly to 750 N-m during the next 1/2 revolution and remains constant for one revolution, the cycle being repeated thereafter. Determine the power required to drive the machine and percentage fluctuation in speed, if the driving torque applied to the shaft is constant and the mass of the flywheel is 500 kg with radius of gyration of 600 mm.

5. a) Explain the terms Sensitiveness, Hunting, Effort, Power and Isochronism in connection with the Governors

   b) Show that the height of a Watt governor is inversely proportional to the square of the speed and comment on the applicability of Watt governor.

6. a) Explain the method of balancing of different masses revolving in the same plane.

   b) Four masses A, B, C and D revolve at equal radii and are equally spaced along a shaft. The mass B is 7 kg and the radii of C and D make angles of 90° and 240° respectively with the radius of B. Find the magnitude of the masses A, C and D and the angular position of A so that the system may be completely balanced

7. The reciprocating mass per cylinder in a 60° V-twin engine is 1.5 kg. The stroke and connecting rod length are 100 mm and 250 mm respectively. If the engine runs at 2500 r.p.m., determine the maximum and minimum values of the primary and secondary forces. Also find out the crank position corresponding these values.

8. a) Discuss briefly about Vibration isolation and Transmissibility

   b) The mass of an electric motor is 120 kg and it runs at 1500 r.p.m. The armature mass is 35 kg and its C.G. lies 0.5 mm from the axis of rotation. The motor is mounted on five springs of negligible damping so that the force transmitted is one-eleventh of the impressed force. Assume that the mass of the motor is equally distributed among the five springs. Determine: 1. stiffness of each spring; 2. dynamic force transmitted to the base at the operating speed; and 3. natural frequency of the system

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Hall Ticket Number :										

R-11 / R-13

Code: 1G555

III B.Tech. I Semester Supplementary Examinations November 2018

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) Explain the mechanism of different modes of heat transfer with a suitable example.

   b) A plane wall is 150 mm thick and its wall area is 4.5 m^2. If its conductivity is 9.35 W/m^0C and surface temperature are steady at 150^0C and 45^0C, determine: (i) Heat flow across the plane wall (ii) Temperature gradient in the flow direction

2. a) Derive expression for heat transfer through a composite plane wall with inside and outside convection.

   b) A wall of 0.6m thickness having thermal conductivity of 1.2 W/mk. The wall is to be insulated with a material having an average thermal conductivity of 0.3 W/mk. Inner and outer surface temperature are 1000^0C and 10^0C respectively. If heat transfer rate is $1400W/m^2$, calculate the thickness of insulation

3. A sphere of 30 mm diameter is initially at a uniform temperature of 450^0C. It is placed in air at 22^0C until its center line temperature reaches 350^0C with the local heat transfer coefficient of 15 W/m^2k. After that the sphere is immersed in a water at 22^0 C with heat transfer co-efficient of 5500 W/m^2k until the center reaches from 350^0C to60^0C. Calculate time required for cooling in air, time required for cooling in water and surface temperature after cooling in air. Take p = 3100 kg/m^3, C_p = 1005 J/kg k, $\alpha = 6.6 \times 10^{-6}$ m^2/s and k = 22 W/mk

4. a) Discuss the physical significance of the following dimensional number Re, Nu, Pr, St and Gr

   b) A flat plate measuring 0.8 m X 0.25 m placed longitudinally in a stream of crude oil which flows with a velocity of 4 m/s. calculate the following:

   Boundary layer thickness at the middle of plate, Shear stress at the middle of the plate and Friction drag on one side of the plate.

5. a) For a fluid flow along flat plate, explain the velocity distribution in a hydrodynamic boundary layer?

   b) A vertical plate at 100^0C is 1 m wide and 20 cm high. It rests in still air at 1 atm and 20^0C. Determine the local heat transfer coefficient at 10 cm from the leading edge of the plate. The properties of the air at film temperature may be taken as: Thermal conductivity is 0.03 W/m.K, Viscosity is 2.03×10^{-5} PaS, Density is 1.00 kg/m^3. Specific heat 1.01 kJ/kg.K.

6. a) A copper pan has a diameter of 150 mm. The bottom of the pan is maintained at 115°C when placed on an electric cooking range. Estimate the heat required to boil the water in this pan. Determine the evaporation rate. What is the ratio of the surface heat flux to the critical heat flux? What pan temperature is required to achieve the critical heat flux?

   b) What is the difference between evaporation and boiling?

7. Derive an expression for logarithmic mean temperature difference in case of parallel flow and counter flow heat exchanger

8. a) Briefly explain the concept of black body.

   b) A large enclosure is maintained at a uniform temperature of 3000k. calculate the following: (i) Emissive power (ii)The wave length $\boldsymbol{\lambda_1}$ below which 20 percent of the emission is concentrated and the wave length $\boldsymbol{\lambda_2}$ above which20 percentage of the emission is concentrated.(iii) The maximum wave length. (iv)Spectral emissive power (v)The irradiation incident.

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Hall Ticket Number :										

R-11 / R-13

Code: 1G553

III B.Tech. I Semester Supplementary Examinations November 2018

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 the use of a chip breaker? Discuss the various types of chips produced during metal machining process.
   b) Briefly explain various factors affecting the tool life

2. a) Explain various tool holding devices adopted in lathe with neat sketches
   b) Describe about multi-spindle automatic lathe machine in detail.

3. a) What is double housing planner? Explain its working.
   b) Differentiate shaper and planner machines.

4. a) Explain briefly the construction of a radial drilling machine labeling its parts.
   b) Write short notes on Deep hole drilling machine.

5. a) With a neat diagram, explain various types of milling cutters and state its uses.
   b) With the help of a sketch, explain the working of a universal dividing head.

6. a) The designation of grinding wheel is 51-A-36-L-5-V-23 explain each letter or numerical stands for.
   b) Discuss the various methods of making grinding wheel

7. a) Draw the broach tool and indicate broach elements on it?
   b) Compare grinding, lapping and honing process.

8. a) Explain principles of design of jigs and fixtures
   b) Explain different method of clamping and holding the work piece.

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Hall Ticket Number :										

R-11 / R-13

Code: 1G551

III B.Tech. I Semester Supplementary Examinations November 2018

Thermal Engineering-II

(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) Saturated steam at 18 bar abs. enters the turbine of a steam power plant and expands to a condenser pressure of 0.8 bar. Determine the Rankine efficiency.

   b) What are the desirable properties of a fluid for use as working substance in a steam engine plant?

2. a) Explain the construction and working of a simple vertical boiler with a neat sketch.

   b) Sketch the Lamont Boiler and explain its working.

3. a) Identify the advantages of artificial draught over natural draught?

   b) A boiler uses 14 kg of air per kg of fuel. The temperature of the hot gasses inside the chimney is 597^{o}C and the outside air is 17^{o}C. If the draught produced is 26 mm of water. Determine the minimum height of the chimney required.

4. a) A nozzle expands steam from 14 bar and 300^{o}C to 6 bar. If the flow rate is 1 kg/sec find the throat area and exit area. What should be the coefficient of velocity if the exit velocity is 550 m/sec

   b) Define degree of super saturation and degree of under-cooling.

5. Explain with the help of a neat sketch a single-stage impulse turbine. Also explain the pressure and velocity variations along the axial direction.

6. a) Discuss the working of a single-stage reaction turbine. Sketch pressure and velocity variations along the axis of the turbine.

   b) Explain the concepts of (i) Degree of reaction (ii) Governing of Turbines

7. a) Define the following

      (i) Vacuum efficiency (ii) Condenser efficiency

   b) Explain the working of a surface condenser. Mention its advantages and disadvantages.

8. a) A double acting steam engine with piston diameter 275 mm, stroke length 650 mm and cut-off 50% of stroke length is supplied steam at a pressure of 7 bar. The back pressure is 1.2 bar. Assuming a diagram factor of 0.75, find indicated power of the engine when it runs at 250 RPM. Also find the mechanical efficiency of the engine if its brake power is 100 KW. Neglect clearance.

   b) Explain “Heat balance sheet”. What important light does it throw on the working of a steam engine?

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