Hall Ticket Number :										

R-17

Code: 7G555

III B.Tech. I Semester Regular Examinations November 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) Describe the process of selection of engineering materials. 7M

   b) Explain the design considerations in machine design. 7M

OR

2. a) State and explain any three theories of failure. 7M

   b) The principal stresses at a critical point in a machine component made of steel 50C4 (S_{yt} = 460 N/mm^2) are as follows: $\pm_1 = 200\ \text{N/mm}^2$, $\pm_2 = 150\ \text{N/mm}^2$ and $\pm_3 = 0$. Calculate the factor of safety by (i) Maximum shear stress theory and (ii) distortion energy theory 7M

UNIT–II

3. a) Explain the following terms in connection with design of machine members subjected to variable loads:

   (i) Endurance limit (ii) Notch sensitivity 4M

   b) A circular bar of 500 mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50 kN. Determine the diameter of bar by taking a factor of safety of 1.5, size effect of 0.85, surface finish factor of 0.9. The material properties of bar are given by : ultimate strength of 650 MPa, yield strength of 500 Mpa and endurance strength of 350 Mpa. 10M

OR

4. a) What is stress concentration factor ?What are the causes of stress concentration 6M

   b) A rod of circular cross section is subjected to an alternating tensile force, varying from 20 kN to 70 kN. Determine the diameter of the rod, according to

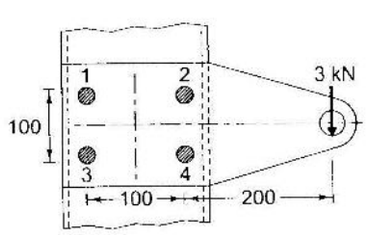
   (i) Goodman method (ii) Soderberg method; using the following material properties: Ultimate tensile strength = 1000 Mpa, Yield strength=550Mpa. Take factor of safety as 2. Neglect stress concentration effect and other correction factors. 8M

UNIT–III

5. a) Define the following terms in connection with external threads

   (i)Thread angle (ii) pitch (iii) major diameter (iv) lead 6M

   b) A bracket is fixed to the steel column by means of four identical bolts (**Fig.1**), two at A and two at B. The maximum load that comes on the bracket is 5 kN acting vertically at a distance of 250 mm from the face of the column. The bolts are made of plain carbon steel 30C8 and the factor of safety is 5. Determine the major diameter of the bolts on the basis of maximum principal stress.



8M

Fig.1

OR

6. a) Derive an expression for strength of single transverse and double fillet weld. 6M

   b) A welded connection of steel plates is shown in (Fig.2). It is subjected to an eccentric force of 60 kN. Determine the size of the weld if the permissible shear stress in the weld is not to exceed 70 N/mm^2.

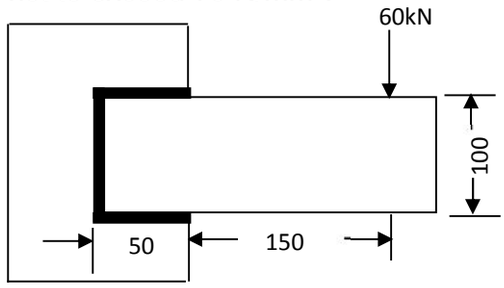


Fig.2 8M

UNIT–IV

7. a) How are the keys classified? 4M

   b) A steam engine cylinder has an effective diameter of 350 mm and the maximum steam pressure acting on the cylinder cover is 1.25 N/mm^2. Calculate the number and size of studs required to fix the cylinder cover, assuming the permissible stress in the studs as 33 MPa. 10M

OR

8. Design and draw a cotter joint to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile stress = compressive stress = 50 MPa ; shear stress = 35 MPa and crushing stress = 90 MPa. 14M

UNIT–V

9. a) What is the effect of cutting keyway in the shaft? 4M

   b) A hollow shaft of 0.5 m outside diameter and 0.3 m inside diameter is used to drive a propeller of a marine vessel. The shaft is mounted on bearings 6 metre apart and it transmits 5600 kW at 150 r.p.m. The maximum axial propeller thrust is 500 kN and the shaft weighs 70 kN. Determine :

      i. The maximum shear stress developed in the shaft, and
      ii. The angular twist between the bearings. 10M

OR

10. Design a protective type of Cast iron flange coupling for a steel shaft to transmit 20Kw at 900 r.p.m., having an allowable shear stress of 40 N/mm^2. The working stress in the bolts should not exceed 30 N/mm^2 .Assume that the same material is used for the shaft and key and that the crushing stress is twice the value of its shear stress and maximum torque is 25 % greater than the full load torque. Take shear stress of Cast iron as 15 N/mm^2. 14M

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Hall Ticket Number :										

R-17

Code: 7G553

III B.Tech. I Semester Regular Examinations November 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 the expression for friction circle radius. 4M

   b) A screw jack is used to raise a load of 5 tonnes the pitch of single start square threads used for the screw is 24 mm. the mean diameter is 72 mm. determine the force to be applied at the end of 1.2 m long handle when the load is lifted with constant velocity and rotate with the spindle. Take $\mu = 0.2$. 10M

OR

2. a) What do you understand about uniform pressure theory? 4M

   b) A single plate friction clutch, with both sides of the plate being effective, is used to transmit power at 1400 r.p.m. It has outer and inner radii 80 mm and 60 mm respectively. The maximum intensity of pressure is limited to $10x10^4 N/m^2$. If the coefficient of friction is 0.3 determine:

   (i) Total thrust exerted on the plate

   (ii) Power transmitted 10M

UNIT–II

3. Fig.1 shows a differential band brake of drum diameter 400 mm. The ends of the band are fixed to the points on the opposite side of fulcrum of the lever at a distance of 50 mm and 160 mm from the fulcrum as shown in the Fig. 1. The brake is to sustain a torque of 300 Nm. The co-efficient of friction between band and the brake is 0.2. The angle of contact is 210^o and the length of lever from the fulcrum is 600 mm. Determine:

   a) The force required at the end of the lever for the clockwise and anti-clockwise rotation of the drum.

   b) Value of OB for the brake to be self-locking for clockwise rotation.

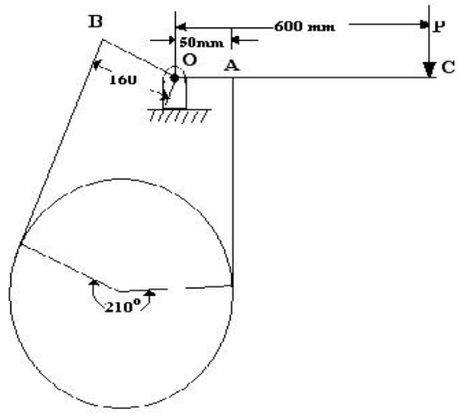

Fig. 1 14M

OR

4. An aircraft consists of a propeller. It also consists of engine and propeller of mass moment of inertia 150 kg m^2. The engine rotates at 3600 r.p.m. in a sense clockwise looking from rear. The aircraft completes half circle of radius 100 m towards left when flying at 360 km per hr. Determine the gyroscopic couple on the air-craft and state its effect. 14M

UNIT–III

5. The areas above and below the mean torque line for an I.C. engine are -25, +200, -100, +150, -300, +150 and -75 mm^2 taken in order. The scale for the turning moment diagram is 1 mm vertical scale = 10 Nm and 1 mm horizontal scale=1.5^0. The mass of the rotating parts are 45 kg with a radius of gyration of 150mm. If the engine speed is 1500 r.p.m., find the co-efficient of fluctuation of speed 14M

OR

6. A proell governor has equal arms of length 300 mm. The upper ends of the arms are pivoted on the axis of the governor. The lower arms are pivoted to links of 40 mm from axis of rotation. Extension arms of the lower links are each 80 mm long & parallel to the axis at minimum radius. The radii of rotation of the balls are 150 mm & 200 mm. The mass of each ball is 10 kg and the mass of the central load is 100kg. Determine the range of speed of the governor. 14M

UNIT–IV

7. A shaft carries four rotating masses A, B, C and D which are completely balanced. The masses B, C and D are 50 kg, 80 kg and 70 kg respectively. The masses C and D make angles of 90^0 and 195^0 respectively with mass B in the same sense. The masses A, B, C and D are concentrated at radius 75 mm, 100mm, 50 mm and 90 mm respectively. The plane of rotation of masses B and C are 250 mm apart. Determine: (i) the mass A and its angular position (ii) the position of planes of A and D 14M

OR

8. The cranks of a two cylinder uncoupled outside cylinder locomotive are at right angles and are 300 mm long. The distance between the centre lines of the cylinder is 1.8 m. The wheel centre lines are 1.4 m apart. The rotating mass per cylinder is 350 kg and the mass of the reciprocating parts per cylinder is 285 kg. The whole of the rotating and two third of the reciprocating masses are to be balanced in the plane of the driving wheels at a radius of 800 mm, then find:

   (a) The magnitude and angular positions of balance masses,

   (b) The maximum speed of the locomotive in km/hr without lifting the wheel s from the rails if the dead load on each driving wheel is 28000N and dia of the driving wheel is 1.8 m and (iii) swaying couple at the maximum speed. 14M

UNIT–V

9. The vibrations of the platform of railway station are periodic at the frequency range of 12-50 Hz. A vibration measuring instrument is to be installed on some foundation independent of the platform. The small foundation is supported by four identical springs resting on the platform. The total mass of the instrument and foundation is 50 kg. What is the maximum value of spring stiffness, if the amplitude of transmitted vibration is to be less than 10% of the platform vibration over the given frequency range. Take ε=0.20. System is treated as single degree of freedom. 14M

OR

10. A steel shaft ABCD 1.5 m long has flywheel at its ends A and D. The mass of the flywheel A is 600 kg and has a radius of gyration of 0.6 m. the mass of the flywheel D is 800 kg and has a radius of gyration of 0.9 m. The connecting shaft has a diameter of 50 mm for the portion AB which is 0.4 m long; and has a diameter of 60 mm for the portion BC which is 0.5 m long; and has diameter of d mm for the portion CD which is 0.6 m long. The modulus of rigidity for the shaft material is 80 GN/m^2 Determine:

   (a) The diameter ‘d’ of the portion CD so that the node of the torsional vibration of the system will be at the centre of the length BC; and

   (b) The natural frequency of the torsional vibrations 14M

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Hall Ticket Number :										

R-17

Code: 7G556

III B.Tech. I Semester Regular Examinations November 2019

Engineering Metrology

(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) With neat sketches differentiate between hole basis system and shaft basis system. 6M

   b) Design the general type GO and NO GO gauge for components having 20H7/f8 fit.
   Where $I = 0.45 (D)^{1/3} + 0.001 D$
   Upper Deviation of "f" shaft = $-5.5 D^{0.41}$ 8M

OR

2. a) Discuss the limitations of Taylor's principles and its applications to 'GO' and 'NO GO' Gauges. 7M

   b) Define Fit. Give classification of different types of fits and explain each of them with suitable examples 7M

UNIT–II

3. a) Explicate the use of
      i. angle gauges
      ii. sine bars for measurement of angles 8M

   b) How are comparators classified? 6M

OR

4. a) Discuss in detail the working principle of Bevel protractor. 7M

   b) Elucidate the working principle of an interferometer. 7M

UNIT–III

5. a) Describe differences between roughness and waviness. 7M

   b) With the help of a neat diagram describe the construction and working of the Talysurf instrument. 7M

OR

6. Explore the applications of comparators and explain any one mechanical comparator with it's applications, advantages and disadvantages 14M

UNIT–IV

7. a) Elucidate the measurement of effective diameter by three wire method 7M

   b) Describe the working of Gear tooth Vernier calipers. 7M

OR

8. a) How do you check the pitch or pitch errors of a screw thread using a pitch measuring machine? 7M

   b) Recall and explain how the various elements of internal threads are measured. 7M

UNIT–V

9. a) Explain the features of coordinate measuring machine (CMM), with neat sketch. 7M

   b) Explain different types of CMMs used in metrology. 7M

OR

10. Write a short notes on Statistical Quality Control. Where do you use control charts and how are they classified. Explain R charts, p charts and c charts 14M

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Hall Ticket Number :										

R-17

Code: 7G551

III B.Tech. I Semester Regular Examinations November 2019

Industrial Management

(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 contributions of Taylor to the theory of management. 7M

   b) Identify the merits of systems approach to management. 7M

OR

2. a) Explain departmentation and decentralization in an organization. 7M

   b) What are the situations which call for adapting committee organization? 7M

UNIT–II

3. a) What is a plant layout? Discuss merits of a good plant layout. 7M

   b) List out and discuss in brief the principles of a plant layout. 7M

OR

4.

Activity	immediate predecessor/s	Activity Time (days)		
		Optimistic time	Most likely time	Pessimistic time
A	-	10	22	28
B	A	4	4	10
C	A	4	6	14
D	B	1	2	3
E	C	1	5	9
F	C,D	7	8	9
G	E,F	2	2	2

   a) Use the above data of a project to develop the project network diagram.

   b) Determine the expected project completion time.

   c) Evaluate the probability of completing the project within 35 days. 14M

UNIT–III

5. Explain in brief

   a) Predetermined motion and time study (PMTS)

   b) Stopwatch technique 14M

OR

6. a) Assume the total observed time for an operation of assembling an electric switch is 1.00 min. If the rating is 120%, find normal time. If an allowance of 10% is allowed for the operation, determine the standard time 7M

   b) Discuss in brief the different types of allowances. 7M

UNIT–IV

7. a) An enterprise requires 2,70,000 units of a certain item annually. The cost per unit is Rs. 3, the cost per purchase order Rs. 100 and the inventory carrying cost Rs.6 per unit per year. What is the economic order quantity? 7M

   b) Explain product life cycle and marketing mix. 7M

OR

8. A consumable item has a demand of 12,000 units per year. The cost of procurement is Rs 200 and the holding cost is Rs 4 per unit per year. The replacement is immediate on requirement and hence there are no stock-outs. Determine a) the economic order quantity b) the number of orders per year c) the time between order and d) the total cost per year, including the purchase cost of one unit is Rs 2. 14M

UNIT–V

9. List out various methods of job evaluation. Explain any of them in detail. 14M

OR

10. a) Discuss functions of Human Resource Management. 7M

    b) Explain any one method of wage incentive system. 7M

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Hall Ticket Number :										

R-17

Code: 7G554

III B.Tech. I Semester Regular Examinations November 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) Describe about mechanics of chip formation? 7M

   b) Write about functions of cutting fluid and thermal aspects? 7M

OR

2. a) Explain about the types of chips. 7M

   b) Write about tool wear and tool life? 7M

UNIT–II

3. Describe about the constructional features and specifications of centre lathe with neat diagram? 14M

OR

4. a) Explain machining time calculations and power estimation of lathe. 7M

   b) Write about automatic screw type – multi spindle with neat diagram? 7M

UNIT–III

5. a) Distinguish between shaper and planer? 7M

   b) Describe about principle of operation of drilling machine with neat sketch? 7M

OR

6. a) Describe about fine boring machine with neat sketch? 7M

   b) State and explain accessories to milling machines. 7M

UNIT–IV

7. Explain different types of grinding process in detail. 14M

OR

8. a) Write the concepts of surface integrity? 5M

   b) Describe about the types of broaching machines? 9M

UNIT–V

9. a) Comparison of lapping and honing machines? 7M

   b) Classify jigs in detail? 7M

OR

10. a) Explain the constructional features of grinding machine. 7M

    b) Write about the work holding devices? 7M

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Hall Ticket Number :										

R-17

Code: 7G552

III B.Tech. I Semester Regular Examinations November 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) Steam is the working fluid in an ideal Rankine cycle with superheat and reheat. Steam enters the first-stage turbine at 8.0 MPa, 480ºC, and expands to 0.7 MPa. It is then reheated to 440ºC before entering the second-stage turbine, where it expands to the condenser pressure of 0.008 MPa. The net power output is 100 MW. Determine

   (a) the thermal efficiency of the cycle,

   (b) the mass flow rate of steam, in kg/h,

   (c) The rate of heat transfer from the condensing steam as it passes through the condenser, in MW. Discuss the effects of reheat on the vapor power cycle. 8M

   b) Explain the various process of Rankine cycle with reheat and regeneration with schematic and T-S diagram 6M

OR

2. a) Consider a steam power plant operating on the ideal reheat Rankine cycle. Steam enters the high-pressure turbine at 15 MPa and 600°C and is condensed in the condenser at a pressure of 10 kPa. If the moisture content of the steam at the exit of the low-pressure turbine is not to exceed 10.4 percent, determine (i) the pressure at which the steam should be reheated and (ii) the thermal efficiency of the cycle. Assume the steam is reheated to the inlet temperature of the high-pressure turbine. 10M

   b) Write a short note on working principle of steam engine 4M

UNIT–II

3. a) Explain the working principle of Lamont boiler with neat sketch 10M

   b) Differentiate induced and forced draught chimneys 4M

OR

4. a) Write the short note on the following

   (i) Feed pumps (ii) Economizer (iii) Air-preheater 6M

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

UNIT–III

5. a) Calculate the throat and exit diameters of a C-D nozzle, which will discharge 820 kg of steam per hour at a pressure of 8 bar superheated to 220°C 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

   b) Which type of nozzle is suitable for high velocity applications? and give the reasons for it. 4M

OR

6. a) Derive the condition for maximum discharge in nozzle 10M

   b) Explain nozzle efficiency with h-s diagram 4M

UNIT–IV

7. a) The outlet and inlet temperatures of cooling water to a condenser are 37.5°C and 30°C respectively. If the vacuum in the barometer is 706 mm of mercury with barometer reading 760 mm, determine the condenser efficiency. 8M

   b) Write the short notes on air pumps used in the condenser and explain its necessity. 6M

OR

8. a) A steam jet turbo-generator develops 100kW using 13.6 kg of steam per kWh. The exhaust steam pressure is 0.14 bar and 680.4 kg of cooling water are passed through the condenser per minute. The inlet and outlet temperatures are respectively 15.6°C and 32.2°C. Estimate the dryness fraction of exhaust steam. Temperature of hot well is 35°C. 10M

   b) Explain the need for the cooling tower and list out the types. 4M

UNIT–V

9. a) Explain the principle of throttle governing with neat sketch 6M

   b) A 50% reaction turbine (with symmetrical velocity triangles) running at 400RPM has the exit angle of the blades as 20° and the velocity of steam relative to the blades at the exit is 1.35 times the mean blade speed. The steam flow rate is 8.33 kg/s and at a particular stage the specific volume is 1.381 m^3/kg. calculate for this stage:

   (i) A suitable blade height, assuming the rotor mean diameter 12 times the blade height 8M

OR

10. a) Derive the condition for maximum efficiency in reaction turbine 10M

   b) Differentiate impulse and reaction turbine 4M

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