Hall Ticket Number :										

R-15

Code: 5G554

III B.Tech. I Semester Supplementary 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.

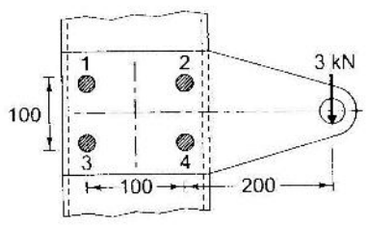

Fig.1

8M

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.

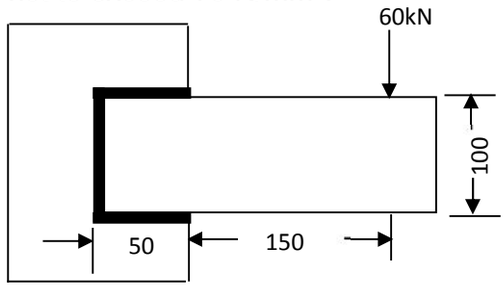

Fig.2 8M

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-15

Code: 5G552

III B.Tech. I Semester Supplementary 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.

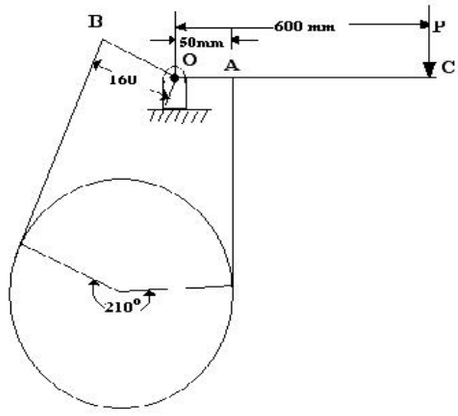

Fig. 1 14M

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-15

Code: 5G555

III B.Tech. I Semester Supplementary Examinations November 2019

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) List out the modes of Heat transfer and define them. 6M

   b) Asbestos layer of 5mm thickness (k=0.115W/mK) is used as insulation material over a boiler wall. Consider an area of 1.0m^2 and find out the rate of heat flow as well as the heat flux over this area if the temperatures on either side of the insulation are 400^0C and 40^0C. 8M

OR

2. a) Derive the three-dimensional general heat conduction equation in Cartesian Coordinate. Deduce the Laplace equation from it. 10M

   b) What is thermal diffusivity? Explain its importance in heat conduction. 4M

UNIT–II

3. a) The temperature at the inner and outer surfaces of a boiler wall made of 20 mm thick steel and covered with an insulating material of 5 mm thickness are 300^0C and 50^0C respectively. If the thermal conductivities of steel and insulating material are 58W/m^0C and 0.116 W/m^0C respectively, determine the rate of flow through the boiler wall. 8M

   b) What is a composite plane wall? Derive expression for temperature distribution and heat flow in a composite plane wall situation. 6M

OR

4. a) A cold storage room has walls made of 23 cm of brick on the outside, 8 cm of plastic foam and finally 1.5 cm of wood on the inside. The outside and inside air temperatures are 22°C and -2°C respectively. The inside and outside heat transfer coefficients are respectively 29 and 12 W/m^2K. The thermal conductivities of brick, foam and wood are 0.98, 0.02 and 0.12 W/m.K respectively. If the total wall area is 90 m^2, determine the rate of heat removal by refrigeration and the temperature of the inside surface of the brick. 8M

   b) Define Biot number and Fourier number. What is its significance? 6M

UNIT–III

5. a) Describe Buckingham's method of π-terms to formulate a dimensionally homogenous equation. 8M

   b) List out the dimensionless numbers used in free convection situation and their mathematical expressions. 6M

OR

6. a) A vertical pipe 80 mm diameter and 2 m height is maintained at a constant temperature of 120°C. The pipe is surrounded by still atmospheric air at 30°C . Find heat loss by natural convection. 8M

   b) Discuss about the development of Hydrodynamic and thermal boundary layer along a vertical plate in a free convection situation. 6M

UNIT–IV

7. a) Show that the emissive power of a black body is π-times the intensity of emitted radiation 8M

   b) Differentiate between Film wise and Drop wise Condensation. Why the heat transfer coefficients are larger in film wise than drop wise condensation? 6M

OR

8. a) Write a short notes on (i) Radiation shape factor (ii) Radiation shields 6M

   b) Describe in detail the process of pool boiling curve with a neat sketch. 8M

UNIT–V

9. a) Discuss briefly on Fouling factor. 6M

   b) Derive the expression for LMTD of a Counter flow heat exchanger. 8M

OR

10. a) Saturated steam at 120^0C is condensing on the outer tube surface of a single pass heat exchanger. The overall heat transfer coefficient is U0 = 1800 W/m^2K. Determine the surface area of a heat exchanger capable of heating 1000 kg/h of water from 20^0C to 90^0C. Also compute the rate of condensation of steam hfg=2200kJ/kg. 7M

    b) Consider a heat exchanger for cooling oil which enters at 180^0C, and cooling water enters at 25^0C. Mass flow rates of oil and water are: 2.5 kg/s and 1.2 kg/s, respectively. Area for heat transfer =16m^2. Specific heat data for oil and water and overall heat transfer coefficient are given: Cpoil=1900J/kgK; Cp water=4184J/kgK; U=285 W/m^2K. Calculate outlet temperatures of oil and water for parallel flow heat exchanger 7M

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Hall Ticket Number :										

R-15

Code: 5G553

III B.Tech. I Semester Supplementary 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-15

Code: 5GA51

III B.Tech. I Semester Supplementary Examinations November 2019

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. What do you mean by Managerial Economics? Describe the Nature and Scope of Managerial Economics?

OR

2. Discuss about the time perspective in business decision? Under what kind of business decisions time perspectives become an important consideration?

UNIT–II

3. What is meant by Elasticity of Demand? How is the Elasticity of Demand measured?

OR

4. Discuss about the cost – output relationship in the short run and the long run?

UNIT–III

5. "Monopolistic competition is the middle ground between perfect completion and monopoly" explain the statement in detail.

OR

6. Briefly explain the features, merits and demerits of public and private sector business organizations?

UNIT–IV

7. A company has **two** investment proposals each costing Rs.1,00,000 and the expected cash inflows are given below;

Year	1	2	3	4	5
Project – A	20,000	30,000	50,000	50,000	20,000
Project – B	35,000	35,000	35,000	35,000	35,000

The cost of capital is 10%. Calculate NPV and Profitability Index. Suggest the management.

OR

8. Define Accounting. Explain Double Entry Book Keeping System. Explain the classification of Accounts with detail examples?

UNIT–V

9. Elucidate the Solvency and Profitability Ratios?

OR

10. The following figures are extracted from the Balance Sheet of X Ltd., as on 31st December.

Particulars	**2017 (Rs.)**	**2018 (Rs.)**	**Particulars**	**2017 (Rs.)**	**2018 (Rs.)**
Stock	25,000	40,000	Bills Payable	2,000	3,000
Debtors	10,000	16,000	Provision for taxes	5,000	7,000
Cash at Bank	5,000	4,000	Bank Overdraft	5,000	15,000
Creditors	8,000	15,000			

Calculate the Current Ratio and Acid Test Ratio for the two years and comment on the Liquidity position of the company.

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Hall Ticket Number :										

R-15

Code: 5G551

III B.Tech. I Semester Supplementary 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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