Roll No. :.................

BT-1831/2031
Examination –Nov- 2022
B.Tech. III Sem: ME, EE, EC, AI
Managerial Economics

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.
Word limit be observed as follows:
Part a – Max 50 words,   Part b – Max 50 words,
Part c – Max 100 words and   Part d – Max 400 words.
Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) What is opportunity cost?   02

    (b) List out the major objectives of the firm.   02

    (c) How does managerial economics relate with other disciplines for propounding its theories?   03

    (d) Write scope of managerial economics.   07

OR

Discuss the role and responsibilities of a managerial economist.   07

Q.2 (a) Define demand and demand curve.   02

    (b) What is meant by industry demand and company demand?   02

    (c) Define the concept supply and the law of supply.   03

    (d) Explain the factors influencing the elasticity of demand in the market with an example.   07

OR

What is an indifferences curve? What are its properties? What role does it play in consumer analysis?   07

Q.3 (a) Why do business entities have to forecast demand?   02

    (b) What are the functions of an Entrepreneur?   02

    (c) What is meant by production? Define production function and describe the underlying assumptions.   03

    (d) Explain the consumer survey method and discuss the merits and demerits of complete enumeration method and sample survey method.   07

OR

How will you define economies of scale? What are the sources of internal and external economies?   07

Q.4 (a) What is Break- even point?

(b) What is inflation? What are the types of inflation?

(c) What do understand by Cost Reduction and Control?

(d) Define Business cycle. Explain various phases of a business cycle.

OR

Explain briefly various types of cost.

Q.5 (a) Why is it important to choose an appropriate form of organisation?

(b) List out the major characteristic features of a perfect market.

(c) What is price discrimination? What are its objectives?

(d) What do you understand by a sole proprietorship firm? Explain its merits and limitation?

OR

Describe graphically the pricing and profit determination under monopoly market. 07

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ME-1832
Examination –Dec- 2022
B.Tech. III Sem : Mechanical Engineering
Machine Drawing & Design

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

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Part a – Max 50 words,   Part b – Max 50 words,
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Word limit NOT to be followed for diagram, numerical, derivation.

Q 1   (a)   What do you understand by designation of steel 25C12S14.   02

(b)   Explain concurrent engineering   02

(c)   Explain the man-machine closed –loop system   03

(d)   With the help of neat diagram explain tolerance. Also explain unilateral and bilateral   07
tolerance with the help of suitable examples.

OR

What is fit? Explain types of fits on hole basis and shaft basis system.   07

Q 2   (a)   With neat sketch represent zig-zag riveted lap joint?   02

(b)   Define efficiency of rivet joint.   02

(c)   Using empirical relations calculate required dimension of double riveted double strap   03
butt joint, when thickness of plate is 12mm.

(d)   Two flat plates subjected to a tensile force P are connected together by means of   07
double-strap butt joint as shown in Fig. below. The force P is 250 kN and the width of
the plate w is 200 mm. The rivets and plates are made of the same steel and the
permissible stresses in tension, compression and shear are 70, 100 and 60 N/mm2
respectively. Calculate

(i)   diameter of the rivets;

(ii)   thickness of the plates;

(iii)   dimensions of the seam, viz., p, pt and m; and

(iv)   Efficiency of the joint.

ME-1832
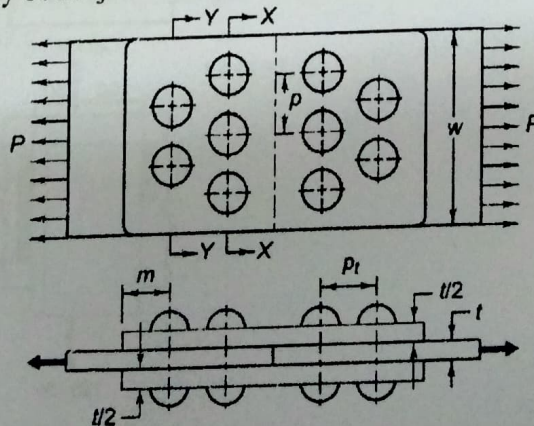
A cylindrical pressure vessel with a 1.5 m inside diameter is subjected to internal steam pressure of 1.5 MPa. It is made from steel plate by triple-riveted double-strap longitudinal butt joint with equal straps. The pitch of the rivets in the outer row is twice of the pitch of the rivets in the inner rows. The rivets are arranged in a zigzag pattern. The efficiency of the riveted joint should be at least 80%. The permissible stresses for the plate and rivets in tension, shear and compression are 80, 60 and 120 N/mm² respectively. Assume that the rivet in double shear is 1.875 times stronger than in single shear. Design the joint and calculate:

    (i)   thickness of the plate; (ii)   diameter of rivets;   (iii) pitch of rivets;

    (iv)   distance between the rows of rivets;   (v)   margin;

    (vi)   thickness of the straps; and   (vii) efficiency of the joint.

|			
Q.3	(a)	Which plane is subjected to maximum shear stress in case of parallel fillet welds	02
	(b)	What is transverse fillet weld?	02
	(c)	Draw butt joint and write strength equation of weld.	03
	(d)	A steel plate, 80 mm wide and 10 mm thick, is joined to another steel plate by means of a single transverse and double parallel fillet welds, as shown in Fig. below. The strength of the welded joint should be equal to the strength of the plates to be joined. The permissible tensile and shear stresses for the weld material and the plates are 100 and 70 N/mm² respectively. Find the length of each parallel fillet weld. Assume that the tensile force passes through the centre of gravity of three welds	07
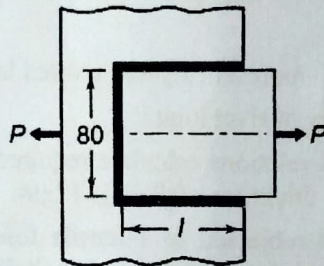
OR

A bracket, as shown in Fig. below is welded to a plate. The welds have the same size, and the permissible force per mm of the weld-length is 1 kN. Calculate the lengths l_1 and l_2.   07
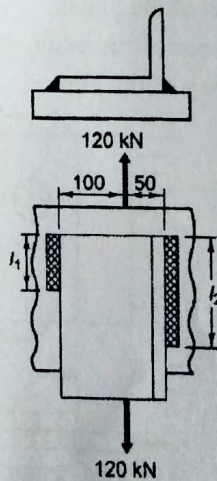
Q.4 (a) Discuss common screw fastening?

(b) Draw neat sketch representing terminology of internal and external threads.   02

(c) What should be the height of nut to make bolted joint equally strong in tension and shear.   03

(d) A steel plate subjected to a force of 5 kN and fixed to a channel by means of three   07
identical bolts is shown in Fig. below. The bolts are made from plain carbon steel 45C8
$(S_{yt} = 380 \ N/mm^2)$ and the factor of safety is 3. Specify the size of bolts
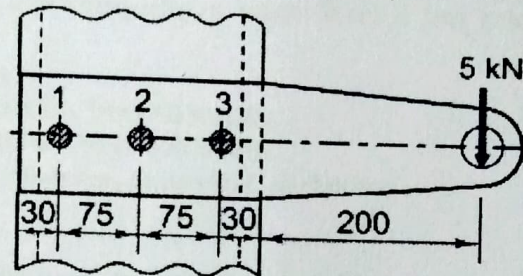
OR

A gearbox weighing 7.5 kN is provided with a steel eye bolt for lifting and transporting   07
on the shop-floor. The eyebolt is made of plain carbon steel 30C8 $(S_{yt} = 400 \ N/mm^2)$
and the factor of safety is 5. Determine the nominal diameter of the eye bolt having
coarse threads.

Q 5 (a) Find allowable shear stress for machine part made of 40C8 $(S_{yt} = 400 \ N/mm^2)$, if factor   02
of safety is 5.

(b) Differentiate between Cotter joint and Knuckle joint.   02

(c) Discuss failure modes prevailed in knuckle pin. Also write strength equations.   03

(d) Two rods are connected by means of a knuckle joint. The axial force P acting on the   07
rods is 25 kN. The rods and the pin are made of plain carbon steel 45C8 $(S_{yt} = 380$
$N/mm^2)$ and the factor of safety is 2.5. The yield strength in shear is 57.7% of the yield
strength in tension. Calculate: (i) the diameter of the rods, and (ii) the diameter of the
pin.

OR

Two rods, made of plain carbon steel 40C8 $(S_{yt} = 380 \ N/mm^2)$, are to be connected by   07
means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from
a steel plate of 15 mm thickness. Calculate the dimensions of the socket end making
the following assumptions: (i) the yield strength in compression is twice of the tensile
yield strength; and (ii) the yield strength in shear is 50% of the tensile yield strength.
The factor of safety is 6.

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ME-1833

Roll No. :.................

Examination –Nov- 2022

B.Tech. III Sem : Mechanical Engineering

Material Science

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

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Part a – Max 50 words,   Part b – Max 50 words,

Part c – Max 100 words and   Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) Write the difference between ionic and covalent bond.   02

  (b) Write various manufacturing processes of steel manufacturing.   02

  (c) What is the difference between crystal and lattice?   03

  (d) Derive the atomic packing factor for the BCC crystal structure.   07

OR

An element X has BCC crystal structure. The atomic Radius and atomic weight of X is   07
0.126 nm and 56 g/mole respectively. Find the density of unit cell of X.

Q.2 (a) Classify the point defects which occur in a crystalline material.   02

  (b) Write the differences between Frankel and Schottky defects.   02

  (c) Compare the hot and cold working. How mechanical properties varies due to hot and   03
    cold working.

  (d) Explain the edge and screw dislocations with neat sketch. How dislocations can be   07
   completely described with the help of Burger's vector and dislocation line.

OR

Describe the annealing process. Explain the three stages which occur during the   07
annealing process. How strength and ductility of the material varies due to annealing.

Q.3 (a) Define the equilibrium phase diagram.   02

  (b) Draw the cooling curve for pure Fe and indicate the variation of phases with   02
    temperature.

  (c) What are Hume-Rothery'srules? Explain with proper examples.   03

  (d) Draw the iron-carbon equilibrium diagram and describe the eutectic, eutectoid and   07
    peritectic points.

OR

What is isomorphous system? Given figure represents a phase diagram of an isomorphous system. Find the fractions of solid and liquid present at the point O, when weight fractions of B at the points L, O and S are 30%, 40% and 60% respectively.
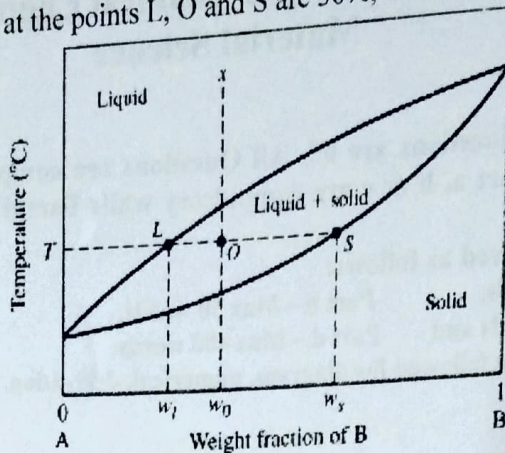
Q.4 (a) What are the objectives of performing the heat treatment processes? **02**

(b) Why quenching process is done. What are the different quenching media? **02**

(c) Compare the aus-tempring and mar-tempering with the proper microstructure. **03**

(d) What is case hardening processes. Describe flame hardening and case hardening with neat sketch. **07**

OR

Describe the precipitation hardening with the help of phase diagram for Al-Cu alloy system. **07**

Q.5 (a) Write the composition of brass and bronze. **02**

(b) What is shape memory alloy? **02**

(c) What are nanomaterials? Write the important properties of nanomaterials. **03**

(d) Define and classify the composite materials on the basis of matrix and reinforcement. An Al-SiC composite has 12 v% of SiC in Al matrix. The hardness of pure Al and SiC are 26 HV and 2500 HV respectively. What will be the hardness of Al-SiC composite (Use rule of mixture). **07**

OR

Explain the various steps involve to manufacture a product through powder metallurgy route. The true density, green density and apparent density of a metal powder are 4.5 g/cm³, 3.6 g/cm³ and 2.1 g/cm³ respectively. Find the densification parameter of the metal powder. **07**

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ME-1833

Examination –Nov- 2022
B.Tech. III Sem : Mechanical Engineering
Strength & Mechanics of Materials

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Word limit be observed as follows:

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Part b – Max 50 words,

Part c – Max 100 words and

Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) Define Hook's law. Write the unit of stress, strain and elastic modulus. 02

(b) Draw tensile stress-strain diagram for mild steel indicting various critical points 02

(c) What is Poisson's ratio? The young's modulus and Poisson's ratio of mild steel are 200 GPa and 0.25 respectively. What will be the modulus of rigidity of mild steel? 03

(d) A brass bar, having cross sectional area 1000 mm^2 is subjected to axial force as shown in Figure. Find the total elongation in the bar, Take E = 1.05×10^5 N/mm^2. 07
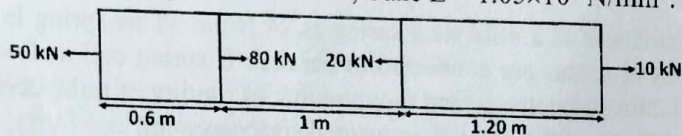
OR

A mild steel rod of 16 mm diameter, 200 mm long is enclosed in a hollow brass tube of 07 external and internal diameters 20 mm and 18 mm respectively. The composite bar is subjected to an axial pull of 50 kN. Find stress in steel rod and brass tube. Take E$_s$ = 200 GPa and E$_b$ = 100 GPa.

Q.2 (a) Define principal planes and principal stresses. 02

(b) Write significance of Mohr's circle in the analysis of principal stresses. 02

(c) A cylinder is 300 mm mean diameter with a wall 2 mm thick. Calculate the maximum 03 pressure difference allowed between the inside and outside if the stress in the wall must not exceed 150 MPa.

(d) A machine element is subjected to the various stresses in plane state of stress condition 07 as shown in the figure. Find the value of normal stress and tangential shear stress on an oblique plane AB which is inclined 30° to the right vertical plane.
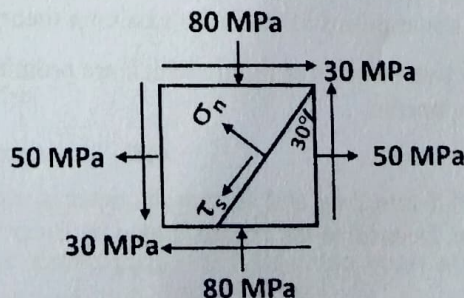
OR

A plane element in a boiler is subjected to tensile stresses of 400 MPa on one plane and 150 MPa on the other at right angles to the former. Each of the above stresses is accompanied by the shear stress of 100 MPa such that when associated with the minor tensile stress tends to rotate the element in anticlockwise direction. Find

(a) Principal stresses and their directions

(b) Maximum shearing stresses and the directions of the plane at which they act.

Q.3 (a) What is angle of twist? 02

(b) Define section modulus of a shaft subjected to a twisting moment. 02

(c) Compare hollow and solid shaft on their strength basis. Take ratio of outer and inner diameter of hollow shaft is 2. Also the outer diameter of hollow shaft is same as the diameter of solid shaft 03

(d) Derive the torsional equation $\frac{T}{J} = \frac{\tau}{r} = \frac{G\theta}{l}$ for a shaft. Where, T = Twisting moment, J = Polar moment of inertia, τ = torsional shear stress, r radius at a point of the cross section, G = Modulus of rigidity of shaft material, θ = angle of twist, and l = length of the shaft. 07

OR

The stiffness of a mild steel spring is 24 N/mm. This spring is cut in three equal pieces and these pieces are connected in parallel. If spring coil and wire diameters are 50 mm and 1 mm respectively and the modulus of rigidity of mild steel is 80 GPa, what will be the stiffness of the parallel connected spring system. 07

Q.4 (a) What is flexural rigidity? 02

(b) Write the relation between shear force and bending moment. 02

(c) Explain point of contra flexure with one example. 03

(d) A cantilever beam of 120 mm wide and 150 mm deep and 1.8 m long. Determine the slope and deflection at the free end of the beam, when it carries a point load of 20 kN at its free end. Take E for the cantilever beam as 200 GPa. 07

OR

Derive the equations for slope and maximum deflection for a cantilever beam with a point load at its free end. 07

Q.5 (a) Define and explain the slenderness ratio. 02

(b) Write the difference between strut and column 02

(c) Describe the assumptions in the Euler's column theory. 03

(d) Describe any two theories of failure which are prominently used to design the mild steel machine components. 07

OR

A steel rod of 5 mm long and 40 mm diameter is used as a column with one end fixed and other free. Determine the crippling load by Euler's formula. Take E as 200 GPa. 07

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ME_1831

ME-1835

Roll No. :................

Examination –Nov- 2022
B.Tech. III Sem : Mechanical Engineering
Fundamentals of Thermodynamics

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.
Word limit be observed as follows:
Part a – Max 50 words,   Part b – Max 50 words,
Part c – Max 100 words and   Part d – Max 400 words.
Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) What is thermodynamic system? State the various types of thermodynamic system. 02

(b) Define the thermodynamics state, process and cycle. 02

(c) State the first law of thermodynamics applied to closed system. 03

(d) What is steady flow process? Derive the steady flow energy equation (SFEE) in a control volume. 07

OR

3.0 kg of air kept at pressure of 1 bar and temperature of 27°C is compressed polytropically ($PV^{1.2} = C$) until the pressure and temperature becomes 15 bar and 227°C respectively. Determine the work of compression and the heat interaction. 07

Q.2 (a) State the Kelvin-Planck's and Clausius's statement of second law of thermodynamics. 02

(b) Define a heat pump and a refrigerator. 02

(c) What is the entropy principle? 03

(d) Draw the $P - V$ diagram and $T - S$ diagram of Carnot cycle and derive the expression for its thermal efficiency. 07

OR

2.0 kg of air initially occupying 1 m^3 at 1.5 bar and 20°C undergoes an internally reversible compression process ($PV^{1.3} = C$) to a final state where the pressure is 6 bar and the temperature is 120°C. Determine the work done on the air and heat transfer and net change in entropy. 07

Q.3 (a) State the ideal gas equation. 02

(b) What is Avogadro's hypothesis? 02

(c) State the deviation of real gases from ideal gases. 03

(d) What is Vander Wall's equation of state? How the constants of equation could be evaluated? 07

OR

1 kg-mole of oxygen at temperature of 350 K undergoes a reversible non-flow 07
isothermal expansion and the volume increases from 0.08 m^3/kg to 0.20m^3/kg. Using
Vander Waal's equation of state, calculate the final pressure and the work done during
the process. Take for oxygen, the values of coefficients a and b are 139.35 ×
10^3 Nm^2/(kg – mol)^2 and 0.0314 m^3/kg – mol respectively.

Q.4 (a) What is pure substance?   02

     (b) Define critical point and triple point?   02

     (c) What is dryness fraction of steam?   03

     (d) Explain the process of the formation of steam with a neat sketch. 07

OR

A vessel of volume 0.04 m^3 contains a mixture of saturated water and saturated steam 07
at a temperature of 250°C. The mass of the liquid present is 9 kg. Determine the specific
volume, the enthalpy, the entropy and the internal energy.

Q.5 (a) State the first and second Tds equations in thermodynamics.   02

     (b) Define volume expansivity and isothermal compressibility.   02

     (c) State the Clausius-Clapeyron equation in thermodynamics.   03

     (d) What is Joule-Thomson coefficient? Show that the Joule-Thomson coefficient is zero 07
          for an ideal gas.

OR

Drive the expression for difference in heat capacities, C_p and C_v.   07

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Examination – Nov- 2022
B.Tech. IV Sem: Mechanical Engineering
Manufacturing Process - I

Time: 3 Hrs

Max. Marks: 70
Min. Marks: 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.
Word limit be observed as follows:
Part a – Max 50 words,   Part b – Max 50 words,
Part c – Max 100 words and   Part d – Max 400 words.
Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) List down the pattern material. In which case wax is preferred.   02

(b) What are various types of pattern allowances? Why shake allowance is given.   02

(c) Draw a labeled diagram of a sand mould and why sprue is made tapered.   03

(d) Explain the various properties of moulding material.   07

OR

With the help of neat sketch describe the working of a cupola.   07

Q.2 (a) What is forging operations? List down the advantages of forging operations.   02

(b) How is blanking and piercing are different.   02

(c) Draw a sketch of punch and die set used for punching operations. Indicates its various 03
parts.

(d) How a square bolt head can be manufactured from a bar by using forging operation   07

OR

Determine the die and punch sizes for blanking a circular disk of 20mm diameter from a 07
c20 steel sheet whose thickness is 1.5 mm.

Q.3 (a) How is an arc obtained in arc welding?   02

(b) Why DC arc welding is more used than AC arc welding in specialized applications.   02

(c) Describe the types of flames obtained in oxy-acetylene gas welding process giving the 03
applications.

(d) Describe the TIG welding.   07

OR

Show by a schematic diagram, a resistance welding operations labeling the important   07
features.

Q.4 (a) How machining is good as compared to other manufacturing process. 02

(b) What is difference between SPCT and MPCT? 02

(c) What is tool life? Describe the Taylor`s equation of tool life. 03

(d) Derive an expression to get economics of metal machining. 07

OR

Explain the various cutting fluid used in machining. 07

Q.5 (a) Differentiate between linear and angular measurement. 02

(b) What is application of sin bar? 02

(c) Write down advantages of Hot working and cold working. 03

(d) Explain the principle of rolling with a neat sketch. Write down its advantages and 07
limitations.

OR

What is comparator? Explain the working of mechanical comparator. 07

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ME-1842
Examination –Nov.- 2022
B.Tech. IV Sem : Mechanical Engineering
Applied Thermodynamics

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.
Word limit be observed as follows:
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Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) What are super critical boilers?   02

     (b) What do you understand by the term boiler draught?   02

     (c) Give a comparison of conventional and high pressure boiler.   03

     (d) Eight kg of steam is produced at 14 bar and 0.95 dryness in a boiler fed with water at   07
          39 ^{0}C, for each kg of coal consumed .The calorific value of coal is 25,000 KJ/kg.
          Determine the equaivalent evaporation "from and at 100 ^{0}C ", and boiler efficiency.

OR

     Describe the construction and working of La-Mont Boiler with neat sketch.   07

Q.2 (a) State the limitations of Carnot vapour cycle.   02

     (b) What are the basic components of steam power plant?   02

     (c) What is reheating? What are the advantage of reheat Rankine cycle?   03

     (d) Describe briefly the Rankine cycle with the help of diagram.   07

OR

     Explain the binary vapour cycle with the help of T-S diagram.   07

Q.3 (a) Define diffuser. Why it is used?   02

     (b) What is mach number?   02

     (c) Define Zone of silence and Zone of action.   03

     (d) What is the effect of friction on the flow through a steam nozzle? Explain with the help   07
          of h-s diagram.

OR

     A projectile is travelling in air having pressure and temperature as 88.3 KN/ m^2 and -2 ^{0}C   07
     .If the Mach angle is 40^0 . Find the velocity of the projectile.

ME-1842

Q.4 (a) What are the advantages of multistage compression? 02

(b) What are rotary compressors? 02

(c) Describe the perfect inter-cooling and imperfect inter-cooling. 03

(d) Explain the effect of clearance volume on the volumetric efficiency of a reciprocating air 07
compressor.

OR

Determine the minimum work required to compress 1 kg of air from 1 bar and 20^0 C to 07
18 bar in two stages, if the inter-cooling is perfect. The compression law process follows
$PV^{1.35}$=C and Take-R=287 J/kgK.

Q.5 (a) Define COP of refrigeration cycle. 02

(b) Why the vacuum is maintained in steam condensers? 02

(c) Give classification of steam condenser. 03

(d) Define cooling towers? Write down the various types of cooling tower used in power 07
plants.

OR

Find the vacuum gauge reading of the condenser ,if the Vacuum efficiency = 95% 07
Temperature of the condensate = 39 ^{0}C(hot well)
Barometer reading = 750 mm of Hg.

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ME-1843
Examination –Nov.- 2022
B.Tech. IV Sem : Mechanical Engineering
Theory of Machine - I

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.
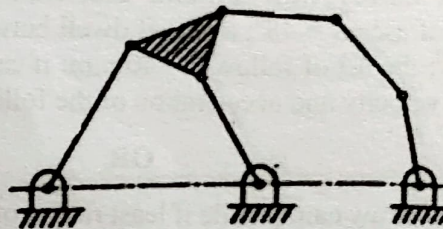Word limit be observed as follows:
Part a – Max 50 words,   Part b – Max 50 words,
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Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) What are the types of links?   02

(b) Differentiate between higher pair and lower pair.   02

(c) Find degree of freedom of mechanism given below   03

(d) Draw inversion of crank slider mechanism on that withworth quick return mechanism is   07
based. Also draw neat sketch of mechanism.

OR

Draw & explain inversions of double slider mechanism.   07

Q.2 (a) What is Instantaneous centre of rotation.   02

(b) Draw neat sketch of slider crank mechanism and locate all I – centre.   02

(c) What do you mean by Coriolis component of acceleration?   03

(d) The crank of a slider crank mechanism is 150 mm and the connecting rod is 600 mm   07
long. The crank makes 300 r.p.m. in the clockwise direction. When it has turned 45^0
from the inner dead centre position, determine velocity of slider and angular velocity of
connecting rod.

OR

In a four bar mechanism ABCD, AD is fixed and is 150 mm long. The crank AB is 40   07
mm long and rotates at 120 r.p.m. clockwise, while the link CD (= 80 mm) oscillates
about D. BC and AD are of equal length. Fond the angular velocity of link CD when
angle BAD = 60^0.

Q.3 (a) Define module of a gear. 02

(b) Define pressure angle. 02

(c) Derive expression for path of contact. 03

(d) What is law of gearing? Derive mandatory condition for constant velocity ratio between two gears. 07

OR

Two mating gears (i.e. larger gear and pinion) have 40 and 20 involute teeth of module 10 mm and 20^0 pressure angle. The addendum is one module. Does the interference occur? 07

Q.4 (a) Define the term cam profile. 02

(b) What are the different types of follower? 02

(c) Define period of ascent and descent. 03

(d) In cam & follower mechanism follower moves with simple harmonic motion during ascent while it moves with uniform acceleration and deceleration motion during descent: Angle of ascent = 48^0; angle of dwell between ascent and descent = 42^0; angle of descent = 60^0; the lift of follower = 40 mm; if cam rotates at 360 rpm anti clockwise. Find maximum velocity and acceleration of the follower during ascent & descent. 07

OR

In above question draw cam profile if least radius of cam 50 mm. 07

Q.5 (a) Define gyroscopic acceleration? 02

(b) State the effect of gyroscopic effect on aircraft when it takes right turn. Aircraft engine is rotating clockwise when viewed from rear. 02

(c) Explain gyroscopic effect naval ship in following during left turn. 03

(d) An aero plane engine flying at240 km/hr turns towards left and completes a quarter circle of 60 m radius. The mass of the rotary engine and the propeller of the plane amounts to 450 kg with a radius of gyration of 320 mm. The engine speed is 2000 rpm clockwise when viewed from the rear. Determine the gyroscopic couple on the aircraft 07

OR

Derive expression for limiting speed of car taking turn. Take R = turning radius, r = radius of wheel, I = moment of inertia of all moving parts and W= weight of the car. 07

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Examination –Nov- 2022
B.Tech. IV Sem: ME, EE, EC, AI
Engineering Mathematics - III

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.
Word limit be observed as follows:
Part a – Max 50 words,　　　　Part b – Max 50 words,
Part c – Max 100 words and　　Part d – Max 400 words.
Word limit NOT to be followed for diagram, numerical, derivation.

Q.1　(a)　Define periodic function.　　　　02

　　　(b)　Give Fourier series expansion of the function $f(x)$ in the interval $(c, c+2\pi)$.　　02

　　　(c)　If the function $f(x) = x - x^3$ then find a_n.　　03

　　　(d)　Find the half range sine series of the function $f(x) = x$ in the interval $(0,\pi)$.　　07

OR

　　　　Find the Fourier sine transform of $x/(a^2+x^2)$.　　07

Q.2　(a)　Write the Laplace transform of $f(t)$.　　02

　　　(b)　Find the Laplace transform of cosat.　　02

　　　(c)　Find the $L^{-1}[(s+1)/(s+2)(s+3)]$.　　03

　　　(d)　Find the $L^{-1}(1/s(s^2+4))$.　　07

OR

　　　　Find $L^{-1}\{s/(s^2+a^2)^2\}$ by using convolution theorem.　　07

Q.3　(a)　Find $\Delta/\Delta x[3x^5]$　　02

　　　(b)　With the usual notation ,Prove that $(1+\Delta)(1-\nabla)=1$　　02

　　　(c)　Find the polynomial for the following data　　03

X :	4	6	8	10
F(x) :	1	3	8	16

　　　(d)　Given the values　　07

x:	5	7	11	13	17
F(x):	150	392	1452	2366	5202

Evaluate f(9)by Newton's divided difference formulae.

OR

Apply Bessel's formula to obtain y_{25} given　　07

$y_{20}=2854$, $y_{24}=3162$, $y_{28}= 3544$, $y_{32}= 3992$.

Q.4 (a) Write Trapezoidal's formula for numerical integration   02

(b) Solve the given system of equation by Gauss elimination method   02

$3x+4y-z=-6$
$-2y+10z=-8$
$4y-2z=-2$

(c)   03

Evaluate $\int_0^6 dx/1+x^2$ by using Simpsons 1/3 rule.

(d) solve the following equations using Crout's method   07

$x-2y+3z=6$
$x-y+2z=9$
$3x+2y-z=16$

OR

Find the first derivative at 1.1 the given data   07

X: 1.0   1.1   1.2   1.3   1.4   1.5   1.6
Y: 7.989 8.403 8.781 9.129 9.451 9.750 10.031.

Q.5 (a) Write the formula of R.K. method.   02

(b) Using Picard's method .find the value of y when x=0.1, if $dy/dx= x-y^2$, $y(0)=1$.   02

(c) Find the value of y when x=0.2 to five decimal places from $y' = x+y$, $y(0)=2$ using   03
Taylor's formula

(d) Find y at x=2.2 if $dy/dx=-XY^2$, $y(2)=1$ Using Euler's method   07

OR

Apply R. K. method to find the value of y for x=0.1 if $dy/dx=X+Y^2$. Given that $y(0)=1$.   07

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