Q1. (a) A real root of the function \( f(x) = \sin^2 x - x^2 + 1 = 0 \) is to be approximated by the iterative scheme \( x_{n+1} = \phi(x_n) \). Determine the iteration function \( \phi(x) \) so that the iterative scheme is convergent. Use the scheme to approximate the root correct to three decimal places. [5]

(b) A real root of the equation \( x^3 - a = 0, (a > 0) \) is to be computed by the iterative scheme

\[
x_{n+1} = px_n + \frac{qa}{x_n^2} + \frac{ra}{x_n^3}, n = 0, 1, ...
\]

Determine the constants \( p, q \) and \( r \) so that the order of the iterative scheme for the said root is as high as possible. Use the above iterative scheme to solve the equation for \( a = 2 \) correct to four decimal place. [5]

OR

(b') Determine the order of convergence of the following iterative scheme

\[
x_{n+1} = \frac{2x_n^3 - 3x_n^2 + 8}{3x_n^2 - 6x_n + 7}, \quad n = 0, 1, ...
\]

Show details of calculation. [5]

(c) Perform three iterations of Gauss-Seidel method and find the approximate solution of the following system of equations

\[
\begin{align*}
    x_1 + 2x_2 + 3x_3 &= -4 \\
    x_1 + 5x_2 + 2x_3 &= -6 \\
    4x_1 + x_2 + x_3 &= 2.
\end{align*}
\]

Take the initial approximation as \( x^{(0)} = (1.5, -1.2, -0.5)^T \). [5]
Q.2

(a) Form the divided difference table for the data given below:

\[
\begin{array}{cccccc}
 x & -4.6 & -3.2 & -1 & 2.2 & 3.2 & 4.6 \\
 f(x) & -360.192 & -149.016 & -12 & -2.784 & 7.656 & 65.952 \\
\end{array}
\]

Use this table to find the interpolating polynomial that fits the data.

(b) A curve is drawn through the points given in the following table:

\[
\begin{array}{cccccc}
 x & 1.0 & 1.5 & 2.0 & 2.5 & 3.0 \\
 y & 2.0 & 2.4 & 2.7 & 3.2 & 3.6 \\
\end{array}
\]

Approximate (i) the radius of curvature \( \rho = \frac{(1+G^2)^{\frac{3}{2}}}{y''} \) at \( x = 1.2 \)

(ii) the area bounded by curve, the x-axis and the ordinates \( x = 1.0, x = 3.0 \) using Simpson's \( \frac{1}{3} \) rule.

OR

(b') Derive two point Gauss formula

\[
\int_{a}^{b} f(x) \, dx = h \left[ f \left( \frac{a + b}{2} + \frac{h}{\sqrt{3}} \right) + f \left( \frac{a + b}{2} - \frac{h}{\sqrt{3}} \right) \right] + E
\]

where \( h = \frac{b-a}{2} \). Apply this formula to evaluate \( \int_{-1}^{1} \cosh \left( \frac{x^2}{10} \right) \, dx \).

(c) Prove the following with usual notation:

\[
\frac{1}{2} \delta^2 + \delta \sqrt{\left( 1 + \frac{\delta^2}{4} \right)} = \Delta
\]

Q3.

(a) Using Taylor's series (up to four degree), solve the initial value problem:

\[
 x \frac{dy}{dx} = x - y, \quad y(2) = 2
\]

at \( x = 2.1 \).

OR

(a') Solve the initial value problem:

\[
x^2 \frac{dy}{dx} + x^2 y^2 + xy = 1, \quad y(1) = -1, \quad 1 \leq x \leq 1.2
\]

by Runge-Kutta method of order 4 in one step.
(b) Write an $O(h^2)$ finite-difference system for approximating the solution of the boundary value-problem:

$$\frac{d^2y}{dx^2} - x^2 \frac{dy}{dx} + y = e^x, \quad y'(2) = 1, \quad y(2.6) = 0.$$ 

Take $h = 0.2$ and solve it.

Q4. (a) A manufacturer of a patent medicines is preparing a production plan on medicine A and B. There are sufficient ingredients available to make 20,000 bottles of A and 40,000 bottles of B, but there are only 45,000 bottles available into which either of the medicines can be put. Furthermore, it takes 3 hours to prepare enough materials to fill 1000 bottles of A and it takes 1 hour to prepare enough materials to fill 1000 bottles of B and there are 66 hours available for this preparation. The profit is Rs. 1 per bottle for A and Rs. 7 per bottle for B.

(i) Formulate the problem as linear programming.

(ii) How to schedule the production so as to get maximum profit?

(Solve Graphically).

OR (a') Construct the dual of the following linear programming problem:

$$\text{Min } z = 1250x_1 + 1000x_2 + 900x_3 + 150x_4,$$

subject to the constraints:

$$2x_1 + 2x_2 + 2x_3 \geq 50$$
$$x_1 + 5x_2 + 3x_3 + x_4 \geq 100$$
$$x_1, x_2, x_3, x_4 \geq 0$$

and then solve the problem graphically.

(b) Solve by Simplex method the linear programming problem:

$$\text{Max } Z = 240x_1 + 104x_2 + 60x_3 + 19x_4,$$

subject to the constraints

$$20x_1 + 9x_2 + 6x_3 + x_4 \leq 20$$
$$10x_1 + 4x_2 + 2x_3 + x_4 \leq 10$$
$$x_i \geq 0, \quad i = 1, 2, 3, 4$$
2013-14
B.TECH. (WINTER SEMESTER) EXAMINATION
MECHANICAL ENGINEERING
MANUFACTURING SCIENCES
ME 303

Maximum Marks: 60
Credits: 05
Duration: Three Hours

Answer all the questions. Assume suitable data if missing. Notations used have their usual meaning. Draw neat sketches to support your answers.

Q.No. Question M.M.
1(a) What are various types of chips formed during metal cutting? Discuss the effect of built-up edge on the cutting phenomenon. Discuss the measures taken to avoid built-up edge. [3]
1(b) With the help of a neat sketch discuss orthogonal cutting. Justify that it is a two dimensional cutting process. [3]
1(c) Following data were obtained while turning with right hand turning tool:
Depth of cut = 2.0 mm
Feed = 3.0 mm/revolution
Chip thickness = 2.5 mm
Tool signature = 0°,-5°,6°,7°,25°,0°,5 mm
Cutting force = 1200 N
Force normal to cutting force = 900 N

Compute

(i) The shear angle of the work material
(ii) Friction force and the force normal to it.
(iii) Friction angle.
(iv) Shear strength of the work material if its shear strength is 450 N/mm².

2(a) What is meant by radial rake angle of a straight edge plain milling cutter? Locate the radial rake angle with help of a neat sketch. Enumerate the parameters for milling a mild steel cubical block to secure orthogonal cutting process. [4]

2(b) In a slab milling operation with straight teeth cutter, the cutter has 15 teeth with 10° rake angle and rotates at 200 rpm. The diameter of the cutter is 80 mm and the table feed is 75 mm/min. The depth of cut is 3 mm. Width of the job is 50 mm and the ultimate shear stress of the work material is 420 N/mm². Let the coefficient of friction...
between the chip and the cutter be 0.7. Compute the average chip thickness.

2(c) Justify that grinding wheel is a multipoint cutting tool.
Develop an expression to calculate the power during milling using a straight edge plain milling cutter.

OR

2' (a) Explain the following processes:
(i) Centre less grinding
(ii) Honing
(iii) Thread rolling.

2'(b) Discuss the following processes:
(i) Case hardening
(ii) Shot peening
(iii) Surface rolling

3(a) Determine the machining rate and feed rate in machining iron electro-chemically using copper electrode and sodium chloride solution (specific resistance = 5 ohm-cm) as electrolyte. Power supply is 25 V and current is 6000 amp, work tool gap is 0.5 cm. Assume density of iron as 7.86 gm/cm³ and Faraday's constant as 96500.

3(b) Discuss the various merits & demerits of Chemical Machining.

3(c) Explain the Characteristics and Working of LBM with diagram.

4(a) (i) Define a fit with reference to design and manufacture of mechanical components.
(ii) What is fundamental deviation? Discuss its role in different types of fits.

4(b) Determine and sketch the limits for tolerance and allowance for a 25mm shaft and hole pair designated H7-f8. The basic size lies in the range of 18-30mm. The tolerance for grade 7 and 8 are 16i and 25i respectively. The fundamental deviation for the f shaft is -5.5 D 0.41 microns.

4(c) What are limit gauges? Describe the Taylor's principle of GO and NO GO gauges. Also, explain the need for Gauge maker's tolerance.

OR

4'(a) Write a short note on slip gauges.

4'(b) Enumerate the advantages and limitations of using wavelength standards as basic units to define primary standards.

4'(c) Explain why it is not advisable to use a Sine bar for measuring angles more than 45°.
4'(d) With the help of a neat diagram explain the working of a differential screw micrometer. [3]

5 Answer any 3 of the following:

a. What is a comparator? Describe the procedure for determining the dimensions of a component using a comparator. Also, explain the working principle of pneumatic comparators. [4]

b. Define effective diameter of a screw thread? Derive a relationship to determine the effective diameter using the two wire method. [4]

c. Describe with the help of a neat sketch the working of a Gear Tooth Vernier Calliper. [4]

d. Explain the principle of measurement by light wave interference method. Hence describe the use of optical flats for dimensional comparisons. [4]
2013-14
B.TECH. (WINTER SEMESTER) EXAMINATION
MECHANICAL ENGINEERING
KINEMATICS OF MACHINES
ME-314

Maximum Marks: 60 Credits: 04 Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No. Question M.M.

1(a) Explain the following terms:
(a) Link (b) Kinematic pair (c) Mechanism (d) Lower pair (e) Binary links
(f) Binary joint.

1(b) What do you understand by degrees of freedom? For a plane mechanism derive an
expression for Grubler's equation.

1(b') Draw a neat sketch of Peaucellier straight line mechanism. Explain with a proof
how the tracing point describes a straight line path.

OR

2 Describe in details the Klein's construction for obtaining the velocity and
acceleration of the reciprocating parts of a steam engine.

OR

2' The crank and connecting rod of a steam engine are 0.5 m and 2 m long
respectively. The crank makes 180 rpm in the clockwise direction. When it has
turned 45° from the inner dead centre position, determine:
(i) Velocity of piston, and (ii) angular velocity of connecting rod.

3 Determine the lengths of all the four links in a four bar chain for the length of the
smallest being 10 cm to generate \( y = \log_{10} x \) in the interval \( 1 \leq x \leq 10 \) for three
accuracy points. The range of angles of input link and output link are
\( 45^\circ \leq \theta \leq 105^\circ \) and \( 135^\circ \leq \phi \leq 225^\circ \)
4(a) What do you mean by pitch point, circular pitch, module, addendum and dedendum of a gear? What is relation between circular pitch, diametral pitch and number of teeth.

4(b) Define the term length of arc of contact and prove that it is equal to the length of path of contact divided by cosine of the pressure angle.

OR

4'(a) Differentiate between i) Simple Gear Train and Compound Gear Train; ii) Reverted Gear Train and Epicyclic Gear Train

4'(b) A simple gear train consists of two gears only, each gear mounted on separate shaft. The shafts are parallel. The smaller gear drives the larger gear. The speed of the smaller gear is 1000rpm. The number of teeth on smaller gear and larger gear are 24 and 60 respectively. Determine: i) speed ratio of gear train ii) Train value of the gear train iii) speed of the larger gear.

5) Draw the profile of a cam operating a knife edge follower (when the axis of the follower passes through the axis of the cam shaft) from the following data:

i) follower to move outward through 30 mm with SHM during 120° of cam rotation
ii) follower to dwell for next 60°
iii) Follower to return to its original position with uniform velocity during 90° of cam rotation
iv) Follower to dwell for the rest of the cam rotation

The least radius of the cam is 20mm and the cam rotates at 240rpm. Determine the maximum velocity and maximum acceleration of the follower during outstroke.
Q.No.  

1(a) Distinguish between constraint force and applied force, giving suitable examples.  
1(b) State, clearly, when a rigid body is said to be in equilibrium.  
1(c) Explain how equilibrium can be achieved in the following cases.  
(i) Two Force member  
(ii) Three force member  
(iii) Member with two forces and a torque  
1(d) A connecting rod of an I. C. engine has a mass of 2 kg and the distance between the centre of gudgeon pin and centre of crank pin is 250 mm. The C. G. falls at a point 100 mm from the crank pin along the lines of centres. The radius of gyration about an axis through the C. G. perpendicular to the plane of rotation is 110 mm. Find the equivalent dynamical system if only one of the masses is located at gudgeon pin.  
If the connecting rod is replaced by two masses, one at the gudgeon pin and the other at the crank pin and the angular acceleration of the rod is 23000 rad/s² clockwise,  

determine the correction couple applied to the system to reduce it to a dynamically equivalent system.  

OR  

1'(a) What is a free body diagram?  
1'(b) Make a complete dynamic force analysis of the four bar linkage as shown in fig (1).  
The link lengths, their masses, moment of inertia and the angular velocities of the various links shown in the Fig.(1) are given as  

\[ R_{AO2} = 7.5 \text{cm}, \ R_{O4O2} = 35 \text{ cm}, \ R_{BA} = 50 \text{ cm}, \ R_{BO4} = 25 \text{ cm}, \ R_{CO4} = 20 \text{ cm}, \ R_{CB} = 15 \text{ cm}, \ R_{G3A} = 25 \text{ cm}, \ R_{G4O4} = 14.24 \text{ cm}, \ M_3 = 3.6 \text{ kg}, \ M_4 = 1.7 \text{ kg}, \ I_{G2} = 0.3125 \text{ Kg-cm}^2, \]

\[ I_{G3} = 0.78125 \text{ Kg-cm}^2, \ I_{G4} = 0.04625 \text{ Kg-cm}^2, \ \omega_2 = 60 \text{ rad/s and } \omega_2 = 0. \]

contd ... 2
2 The turning moment diagram for a multi cylinder engine has been drawn to a scale of 1 mm to 500 N-m torque and 1 mm to 6° of crank displacement, as shown in fig.(2). The intercepted areas between output torque curve and mean resistance line taken in order from one end in sq. mm are - 30, + 410, - 280, + 320, - 330, + 250, - 360, + 280, - 260 sq. mm, when the engine is running at 800 rpm.

The engine has a stroke of 300 mm and the fluctuation of speed is not to exceed 2% of the mean speed. Determine a suitable diameter and cross section of the flywheel rim for a limiting value of the safe centrifugal stress of 7 MPa. The material density may be assumed as 7200 Kg/m³. The width of the rim is to be 5 times the thickness.

3(a) The crank shaft of an inside cylinder locomotive has two cranks at right angle and they are symmetrically placed at a distance, c / 2, from the center on each side of the engine. The equivalent mass at each crank pin is m, and the balanced is achieved by two balancing masses, each of mass M placed in each driving wheel at a radius R. The distance between the wheels is l, and the radius of crank is r. Show that the balancing mass is given by,

\[ M = m \cdot r \cdot \sqrt{(l^2 + c^2)} / \sqrt{2} \cdot R \cdot l \]

Given that \( \beta = (180 - \theta) \), in elevation and \( \beta = (90 - \theta) \), in end view, also prove that the angular position of the mass with respect to the adjacent crank is given by

\[ \tan^{-1} \left\{ \left( c - l \right) / \left( c + l \right) \right\} \]

3(b) In a three cylinder and three crank engine, the reciprocating parts for each cylinder is 900 kg. The length of stroke is 48 cm and length of the connecting rod is 108 cm. The distance between the cylinders centre lines is 72 cm and the cranks are set at 120°. Examine primary and secondary forces and estimate out of balance primary and secondary couples, when the engine is running at 180 rpm in the clockwise direction.

3(c) The rotor shown in Fig. 3 has the following properties:

- \( m_1 = 3 \text{ kg} \)  \( r_1 = 30 \text{ mm} \)  \( \theta_1 = 30^\circ \)  \( l_1 = 100 \text{ mm} \)
- \( m_2 = 4 \text{ kg} \)  \( r_2 = 20 \text{ mm} \)  \( \theta_2 = 120^\circ \)  \( l_2 = 300 \text{ mm} \)
- \( m_3 = 2 \text{ kg} \)  \( r_3 = 25 \text{ mm} \)  \( \theta_3 = 270^\circ \)  \( l_3 = 600 \text{ mm} \)

\( r_{c1} = 35 \text{ mm and } r_{c2} = 20 \text{ mm} \)

\( l_1, l_2, \text{ and } l_3 \) are the distances from bearing 1. The axial distance between the bearings is 500 mm. Determine the counter mass to be placed in the planes of \( m_1 \) and a mid-plane...
of $m_2$ and $m_3$ for the complete balance.

4(a) What is the function of a cam and follower in a mechanical system? Give a brief classification of cams and show their types with suitable diagrams.

OR

4(a') Explain the motion programme of a tangent cam with roller follower.

4(b) Draw the profile of a cam operating a knife edge follower from the following data:
   (i) It lifts the follower through 3.75 cm during its $60^0$ rotation with S.H.M.
   (ii) The follower remains at rest for next $40^0$ rotation of the cam
   (iii) The follower then descends to its original position during $90^0$ rotation of the cam with S.H.M.
   (iv) The follower remains at rest for the rest of the revolution.
       The least radius of cam is 5 cm. If the cam rotates at 300 r.p.m., find the maximum velocity and acceleration the follower during ascent and descent.

5(a) What is meant by effort and power of a governor? Derive the mathematical expression of the power for a Porter Governor.

OR

5(a') Explain the gyroscopic effect on naval ships with suitable diagrams.

5(b) The masses of balls in a spring controlled Hartnell governor is 1.5 kg each which rotates about a vertical axis. The vertical and horizontal arms of the bell crank lever are 120 mm and 100 mm respectively at 560 rpm. The equilibrium speed is 590 rpm when the masses rotate at their maximum radius of 150 mm. Determine:
   i) the stiffness of the spring,
   ii) the compression of the spring at 560 rpm and
   iii) the radius at which the masses rotates when the speed is 530 rpm.

5(c) Derive the equation of the speed of a Procell governor?

OR

5(c') Derive the condition of stability for a four wheel drive while taking a turn.
2013-14  
B.TECH. (WINTER SEMESTER) EXAMINATION  
MECHANICAL ENGINEERING  
MACHINE DESIGN-II  
ME-316

Maximum Marks: 60  
Credits: 04  
Duration: Three Hour

Answer all the questions.  
Notations used have their usual meaning.  
Assume suitable data if missing

<table>
<thead>
<tr>
<th>Q No.</th>
<th>Question</th>
<th>M.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Answer any two of the following question.</td>
<td>[2x6]</td>
</tr>
<tr>
<td></td>
<td>a) Draw different types of welded joints; write the stresses induced in the fillet and butt welds subjected to tensile loads. List the advantages of welded joints over riveted joints?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Figure 1 shows a circular shaft, welded to a support by the mean of a fillet weld. If the diameter of the shaft is 60mm and the permissible shear stress in the weld is limited to 95 N/mm². Determine the size of the weld.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) A force F = 7.5kN acts on the bracket shown in figure 2. Find the combined stress in the weld metal.</td>
<td></td>
</tr>
<tr>
<td>2(a)</td>
<td>What is a clutch? How it is different from brake? Mention different types of clutches. Also, explain the advantages of disc clutch over cone clutch.</td>
<td>[06]</td>
</tr>
<tr>
<td>2(b)</td>
<td>A soft surface cone clutch must handle 225 N-m torque at 1250 rpm. The large diameter of the clutch is 375mm and the included angle is 20°. The face width is 80mm and the coefficient of friction is 0.25. determine:</td>
<td>[06]</td>
</tr>
<tr>
<td></td>
<td>i) Axial force required to engage the clutch.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) The normal pressure required when the clutch is operating at capacity. Assume uniform pressure theory.</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2'(a)</td>
<td>Draw a neat sketch of an internal expanding shoe brake and derive the expression of its torque transmitting capacity. State all the assumptions made.</td>
<td>[06]</td>
</tr>
<tr>
<td>2'(b)</td>
<td>In a band and block brake having 10 blocks, each subtending an angle of 15° at the centre of the wheel. Determine the maximum force required at the end of the lever for the brake to absorb 250kW power at 280 rpm. The effective diameter of the drum is 840 mm. Take μ = 0.35, a = 200mm, b = 40mm and l = 300mm. See figure 3. The drum rotates in clockwise direction and the symbols have their usual meanings.</td>
<td>[06]</td>
</tr>
<tr>
<td>3(a)</td>
<td>Describe a helical torsion spring and derive the equations for bending stress, deflection and spring rate of torsion spring subjected to bending load.</td>
<td>[06]</td>
</tr>
</tbody>
</table>
3(b) A spring is made of wire of 2.36 mm diameter and 1280 MPa as ultimate tensile strength. The outer diameter is 19 mm and active number of coils is 19. Determine
(i) Static load corresponding to yield point of the material and deflection corresponding to that.
(ii) Solid height assuming the ends squared and ground
(iii) Stiffness of the spring.
Take G = 0.85 MPa

4(a) Derive the Lewis bending strength equation of gear teeth.

4(b) A 14 teeth precession made pinion is to drive a 21 teeth gear with center distance of 52.5 mm, face width 58 mm and teeth 20° full depth with dedendum 1.25 module. The pinion rotates at 1150 rpm, and 4 Kw is to be transmitted under steady state conditions. Material selected is a forged BSO 80 M40 steel heat treated to a hardness of 235 Bhn. Determine the factor of safety guarding against a fatigue failure of 99% reliability with better than average mounting conditions and cutting accuracy. Use \( C_p = 191\sqrt{MPa} \) and a life of \( 10^6 \) load applications.

5(a) Explain pressure generation mechanism in hydrodynamic bearings.

5(b) It is required to find the load carrying capacity of a journal bearing having length 50 mm. Viscosity of oil at operating temperature is 20 cp, journal speed 1440 rpm, \( L/D = 1.0 \), radial clearance = 0.05 and eccentricity ratio is 0.75. Also determine power lost in friction and the oil temperature, if whole of the heat can be dissipated. Use \( k = 0.273 \frac{^0cm^2}{w} \).

OR

5'(a) Define the following terms with reference to rolling element bearings.

(i) Static load rating  (ii) Rating life  (iii) Basic load rating  (iv) Meadian life.

5'(b) A deep groove ball bearing No. 6408 for which static load capacity is 36.5 KN and dynamic load capacity 63.5 KN carries a radial load of 6 KN and axial thrust of 3.5 KN. The bearing rotates at 1440 rpm. The bearing is expected to have a life of 5 kh with reliability of 99.9%. Calculate the dynamic load capacity of the bearing, so that it can be selected from the manufacturer's catalogue based on reliability of 90%.
All dimensions in 'mm'

Figure 1

Dimensions in millimeters

Figure 2

Figure 3

LIFE AND RELIABILITY MODIFICATION FACTORS

<table>
<thead>
<tr>
<th>Cycles of Life</th>
<th>Life Factor</th>
<th>Reliability</th>
<th>Reliability Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10^7$</td>
<td>1.5</td>
<td>Up to 0.99</td>
<td>0.80</td>
</tr>
<tr>
<td>$10^8$</td>
<td>1.3</td>
<td>0.99 to 0.999</td>
<td>1.00</td>
</tr>
<tr>
<td>$10^9$</td>
<td>1.1</td>
<td>0.999 up</td>
<td>1.25 up</td>
</tr>
<tr>
<td>$10^{10}$ up</td>
<td>1.0</td>
<td></td>
<td></td>
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</tbody>
</table>

OVERLOAD CORRECTION FACTOR

<table>
<thead>
<tr>
<th>Source of Power</th>
<th>Driven machinery</th>
<th>Uniform</th>
<th>Moderate shock</th>
<th>Heavy shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniform</td>
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<td>1.00</td>
<td>1.25</td>
<td>1.75</td>
</tr>
<tr>
<td>Light shock</td>
<td></td>
<td>1.25</td>
<td>1.50</td>
<td>2.00</td>
</tr>
<tr>
<td>Medium shock</td>
<td></td>
<td>1.30</td>
<td>1.75</td>
<td>2.25</td>
</tr>
</tbody>
</table>

LOAD DISTRIBUTION FACTORS

<table>
<thead>
<tr>
<th>Characteristics of Supports</th>
<th>Face width, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-50, 150, 225, 400 up</td>
<td></td>
</tr>
<tr>
<td>Accurate mounting, small bearing clearance, minimum deflection, precision gears</td>
<td>1.2</td>
</tr>
<tr>
<td>Low rigidity mounting, less accurate gears, contact across full face</td>
<td>1.5</td>
</tr>
<tr>
<td>Accuracy and mounting such that less than full face contact exists</td>
<td>Over 2.0</td>
</tr>
</tbody>
</table>
Table: X and Y factors for single-row deep groove ball bearings

<table>
<thead>
<tr>
<th>( \left( \frac{F_x}{C_0} \right) )</th>
<th>( \left( \frac{F_y}{F_x} \right) \leq \epsilon )</th>
<th>( \left( \frac{F_y}{F_x} \right) &gt; \epsilon )</th>
<th>( \epsilon )</th>
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<tbody>
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<tr>
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<td>1</td>
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<td>0.56</td>
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<td>0.070</td>
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<tr>
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</tbody>
</table>

Coeficient of friction with thickness \( \delta \) (in microns)

Diagram: Bearing characteristic number, \( s = \left( \frac{F_x}{C_0} \right)^{a_{Bx}} \)
Q.No.

1. Liquid propane \((C_3H_8)\) enters a combustion chamber at \(25^\circ C\), 1.2 kg/min, where it is mixed and burned with 150% excess air that enters the combustion chamber at \(12^\circ C\). If the combustion is complete and the exit temperature of the combustion gases is 1200K, determine (a) the mass flow rate of air and (b) the rate of heat transfer from the combustion chamber. Changes in kinetic and potential energy terms may be neglected. Take: \(h_f^c\) for liquid \(C_3H_8 = -118910\) kJ/kmol, \(\bar{h}_{285K}\) (kJ/k mol) for \(O_2\) and \(N_2\) as 8296.5 and 8286.5 respectively. Treat \(H_2O\) in gaseous form in the products of combustion.

OR

1'. A gaseous mixture of 1 kmol of benzene \((C_6H_6)\) and 30% excess air is contained in a rigid vessel at 1atm and \(25^\circ C\). This mixture is then ignited. All the hydrogen in the fuel burns to \(H_2O\), but only 92% of the carbon burns to \(CO_2\), the remaining 8% forming \(CO\). If the final temperature in the vessel is 1000K, determine the heat transferred from the vessel. Both the reactants and products are ideal gases. \(h_f^c\) for gaseous benzene = 82930 kJ/kmol.

2(a) Explain the effects of increase in boiler pressure on Rankine cycle with the help of T-s plot.

2(b) Differentiate between boiler and steam generator. In a steam power plant, feedwater enters and leaves the economizer at 150 bar, 40°C and 150 bar, 80°C respectively. It then goes to the boiler and exits as dry saturated steam at 150 bar. The steam is then taken to the superheater, where it is superheated to 500°C at the same pressure and
then goes to the high pressure turbine. A fraction of steam is then bled off from the high pressure turbine at 100 bar with 0.9 dryness fraction and supplied to the re-heater where it is re-heated to 500°C at the same pressure and then taken to a low pressure turbine where the steam is expanded to the condenser pressure of 15 kPa. The condensed steam then goes to the feedwater pump (FPWP). The liquid water leaves the FWP at 150 bar and 40°C and goes to the economizer to complete the cycle. Atmospheric air enters the air-preheater at 300K and leaves for the furnace at 580°C. Show the arrangement/plant layout of the components with a neat sketch, labelling the state points and calculate the heat transferred in the economizer, boiler, superheater, re-heater and the air-preheater. \( C_{p_{air}} = 1.004 \text{ kJ/kgK} \).

OR

2' For a reheat-regenerative Rankine cycle, steam enters the turbine at 10 MPa, 500°C. Some steam is bled off at 1 MPa for constant pressure reheating and returned to the turbine at 500°C. After that, a fraction 'y' is extracted from the turbine at 0.6 MPa and taken to an open feed water heater (OFWH), which is also at 0.6 MPa. The liquid leaving the OFWH is assumed as saturated liquid at the same pressure. The remaining steam '1-y' is then expanded in the turbine to the condenser pressure of 15 kPa. The feedwater pump placed after the condenser raises the pressure to 0.6 MPa and delivers it to the OFWH, whereas the second pump deployed after the OFWH feeds the water to the boiler at 10 MPa. Assuming isentropic turbine and pump efficiencies respectively as 84% and 80%, calculate the heat and work interactions, net work and thermal efficiency of the plant. Draw the plant layout and show the resulting cycle on a T-s diagram.

3 Consider equilibrium expansion of steam through a convergent-divergent nozzle, with steam conditions at the inlet as 2 MPa, 400°C; mass flow rate of 2.5 kg/s and negligible velocity. The exit pressure is 300 kPa. The flow is considered isentropic between the entrance and throat. From the throat till exit, isentropic nozzle efficiency, \( \eta_{nzzle} = 93\% \). Determine (i) velocities and areas at the throat and exit, (ii) velocity of sound and Mach numbers at the throat and exit. For calculating velocity of sound, the expression \( [\Delta P / \Delta(1/v)]^{1/2} \) can be used at the throat and exit, with \( \Delta P \) as: \( \pm 25 \text{ kPa} \).
The nozzles of a simple impulse turbine are inclined at an angle of 20° in the direction of the path of moving blades. The steam leaves the nozzles at 375 m/s and the blade speed is 165 m/s. Find suitable inlet and outlet angles for the blades in order that there shall be no axial thrust on the blades, allowing for the velocity of the steam in passing over the blades being reduced by 15%. Also determine the power developed for the steam flow of 1 kg/s at the blades and the kinetic energy of the steam finally leaving the wheel.

5(a) Explain the phenomenon of undercooling of condensate in case of surface condensers and its effects on the plant performance.

5(b) Steam with 0.9 dryness fraction, temperature of 38°C and mass flow rate of 20000 kg/hour enters a downflow surface condenser. The mass of air removed is estimated at 6 kg/hour. Neglecting the partial pressure of dry air entering at 38°C. Calculate the saving in the make up water and percentage reduction in air pump capacity, if (i) the air and the condensate are removed from the base of the condenser at 36°C, (ii) the air is removed separately at 27°C using an air extraction pump fitted at the air cooler section, while only the condensate is removed at 36°C from the condenser base. Also calculate the mass flow rate of cooling water used in the condenser for a temperature rise of 5.5K. Draw the schematic diagram of the problem.
Q.No.          Question                                                                                      M.M.
1(a)           What are the mixture requirements in SI engines for steady state operation? Discuss in detail all the three ranges of operation. [5]
1(b)           An un-supercharged petrol engine develops 735 kW with air-fuel ratio 12.8. The brake specific fuel consumption is 0.35 kg/kWh and the mechanical efficiency is 86%. The inlet pressure is 730 mmHg (Abs.) and the mixture temperature is 325 K. The engine is supercharged to a pressure ratio of 1.6 by a supercharger of isentropic efficiency 0.7 and mechanical efficiency 0.9. Assuming that air-fuel ratio remains unchanged and indicated power is proportional to inlet density, calculate the power required to run the supercharger. Assume that the volumetric efficiency does not change due to supercharging. [7]

OR

1'(a)          What do you understand by 'Scavenging' in 2-stroke engines? With the help of neat sketches, discuss different systems and types of scavenging. Also define 'Trapping efficiency' and 'Scavenging efficiency'. [6]
1'(b)          The following data refers to a ten cylinder 2-stroke engine;
                Power output = 1000 kW at 1500 rpm
                Fuel consumption = 0.3 kg/kWh,  Injection period = 18° CA
                Injection pressure setting = 200 bar (min) to 600 bar (max)
                Cylinder pressure at injection = 30 bar,  Maximum cylinder pressure = 60 bar [6]
Calculate the area of injector orifice. Take coefficient of discharge for injector and density of fuel as 0.65 and 850\,\text{m}^3/\text{kg} respectively.

2(a) Discuss the following in case of an actual 4-stroke cycle engine
   (i) Time loss (ii) Exhaust blowdown loss (iii) Pumping loss

2(b) Derive an expression for the change in efficiency with change in \(C_v\) of Diesel cycle in terms of the air standard efficiency (\(\eta\)), specific heat ratio (\(\gamma\)), compression ratio (\(r\)) and cut-off ratio (\(p\)). What will be the effect on the efficiency of a diesel cycle having a compression ratio of 20 and a cut-off ratio as 5\% of the swept volume? The increase in \(C_v\) with temperature is 1\%. Take \(C_v = 0.717\) and \(R = 0.287\,\text{kJ/kgK}\).

OR

2'(a) Describe the 4-stroke Ideal engine processes and obtain the expressions for exhaust gas residual fraction (\(f\)) and temperature of the charge before compression (\(T_1\)).

2'(b) The air-fuel ratio in a diesel engine is 29:1. If the compression ratio is 16:1 and the temperature at the end of compression is 900\,\text{K}, find at what cylinder volume the combustion is completed? Express this volume as a percentage of stroke. Assume that the combustion begins at TDC and takes place at constant pressure. Take calorific value of fuel as 42\,\text{MJ/kg}, \(R = 0.287\,\text{kJ/kgK}\) and \(C_v = 0.709 + 28 \times 10^{-6} \, T \, \text{kJ/kgK}\).

3(a) Describe the term ‘Ignition lag’. Discuss the effect of engine variables on Ignition lag in SI engines.

3(b) Explain the phenomenon of ‘Diesel knock’. Compare it with the phenomenon of ‘Detonation’ in SI engines.

4(a) Briefly give the working differences between Turbojet and Ramjet engines.

4(b) List some commonly used Liquid and Solid propellants in Rocket engines.

4(c) Determine the specific work output, specific fuel consumption and cycle efficiency for a heat exchange cycle as shown in fig., having the following specifications
   Compressor pressure ratio = 4.0, Turbine inlet temperature = 1100\,\text{K}
   Isentropic efficiency of compressor = 0.85, Isentropic efficiency of turbine = 0.87
   Mechanical transmission efficiency = 0.99, Combustion efficiency = 0.98
   Heat exchanger effectiveness = 0.80
Pressure losses:

Combustion chamber = 2% of compressor delivery pressure
Heat exchanger (air-side) = 3% of compressor delivery pressure
Heat exchanger (gas-side) = 0.04 bar

Ambient conditions = 1 bar, 288 K

OR

4'(a) Discuss the advantages of reheating in gas turbine plants. Show that for maximum turbine work with perfect reheating, the pressure ratio for each expansion stage is same.

4'(b) A jet aircraft is flying with a velocity of 965 km/h at an altitude of 12.2 km, where the pressure is 20 kPa and the temperature is 220 K. The air enters an ideal diffuser and leaves the combustor at 1350 K and 100 kPa. The fuel has a heating value of 43 MJ/kg. All expansion and compression processes are isentropic. Determine the (i) compressor work (ii) fuel-air ratio (iii) pressure entering the nozzle (iv) specific thrust (v) propulsive efficiency (vi) thermal efficiency (vii) total thrust for an air flow of 32 kg/s.

5(a) Discuss the suitability of the following alternative fuels in CI engines
(i) Alcohols (ii) Vegetable oils (iii) Bio-gas

5(b) What is the role of fuel additives in IC engines. Discuss some important additives used in IC engines.
Q.No. Question

1(a) List various types of chips formed during metal cutting. Discuss the effect of application of an efficient cutting fluid on the type of chip formed during metal cutting process. Propose an efficient cutting fluid for products made up of mild steel. [3]

1(b) With the help of a neat sketch discuss orthogonal cutting. Justify that it is a two dimensional cutting process. [3]

1(c) Following data were obtained while turning with right hand turning tool:
Depth of cut = 2.0 mm
Feed = 3.0 mm/revolution
Chip thickness = 2.5 mm
Tool signature = 0°,-5°,6°,7°,25°,0°,5 mm
Cutting force = 1200 N
Force normal to cutting force = 900 N

Compute
(i) The shear angle of the work material
(ii) Friction force and the force normal to it.
(iii) Friction angle.
(iv) Shear strength of the work material if its shear strength is 450 N/mm².

2(a) What is meant by radial rake angle of a straight edge plain milling cutter? Locate the radial rake angle with help of a neat sketch. Enumerate the parameters for milling a mild steel cubical block to secure orthogonal cutting process. [4]

2(b) (i) Develop an expression to calculate the power during milling using a straight edge plain milling cutter. [3]
(ii) In a slab milling operation with straight teeth cutter, the cutter has 15 teeth with 10° rake angle and rotates at 200 rpm. The diameter of the cutter is 80 mm and the table feed is 75 mm/min. The depth of cut is 3 mm. Width of the job is 50 mm and the ultimate shear stress of the work material is 420 N/mm². Let the coefficient of friction between the chip and the cutter be 0.7. Compute the average chip thickness.

2(c) Justify that grinding wheel is a multipoint cutting tool.

2(a) Discuss the following processes:

(i) Case hardening
(ii) Shot peening
(iii) Surface rolling

2(b) What is meant by a jig? Give its application in drilling operation.

Give details with the figure of a jig for the mass production of following products requiring drilling of 10 mm diameter (4 holes as mentioned in the figure below). The thickness of the products is approximately 7 mm. Give the details of the materials of the parts incorporated in the jig.

All dimensions are in mm.

3(a) What are the distinctive requirements of cutting tools used in CNC machines? What is meant by Qualified tools? Explain their importance in CNC machines.

3(b) Give G – M code of any four of the following:

(i) Absolute dimensioning system
(ii) Rapid positioning of the cutting tool
(iii) Feed rate
(iv) Spindle on (clockwise)
(v) Dimensions in millimetres

contd...
Coolant on

3(c) Develop a programme to machine a mild steel rod of diameter 20 mm and 30 mm long to a final product of the given dimension on CNC lathe:

![Diagram of dimensions]

All dimensions are in mm.

4(a) i. Define a fit with reference to design and manufacture of mechanical components. [02]

ii. What is fundamental deviation? Discuss its role in different types of fits. [02]

4(b) Determine and sketch the limits for tolerance and allowance for a 25mm shaft and hole pair designated H7-f8. The basic size lies in the range of 18-30mm. The tolerance for grade 7 and 8 are 16i and 25i respectively. The fundamental deviation for the shaft is \(-5.5 \times 10^{-4}\) microns. [04]

4(c) What are limit gauges? Describe the Taylor’s principle of GO and NO GO gauges. Also, explain the need for Gauge maker’s tolerance. [04]

OR

4'(a) In the context of measuring instruments, differentiate between

a. Span and range

b. Threshold and Resolution

4'(b) Enumerate the advantages and limitations of using wavelength standards as basic units to define primary standards. [03]

4'(c) Explain why it is not advisable to use a Sine bar for measuring angles more than 45 degrees. [03]

4'(d) What is the limit of accuracy to which a steel rule may be used for determining the linear dimensions of a component? Explain how this problem can be overcome and accuracy improved by using vernier principle. In a vernier calliper, 2.5 cm on the main scale is divided into 50 divisions and 49 main scale divisions are divided into
50 divisions on the vernier scale. What is the accuracy of measurement that can be achieved?

5. Answer any 3 of the following:

a. What is a comparator? Describe the procedure for determining the dimensions of a component using a comparator. Also, explain the working principle of a pneumatic comparators.

b. Define effective diameter of a screw thread. Derive a relationship to determine the effective diameter using the two wire method.

c. Describe with the help of a neat sketch the working of a Gear Tooth Vernier Calliper.

d. Explain the principle of measurement by light wave interference method. Hence, describe the use of optical flats for dimensional comparisons.
Q.No. 1(a) Consider the superposition of a uniform stream having velocity \( U_0 \) and line sources of equal strengths \( q \) located symmetrically on the y-axis at \((0, +a)\) and \((0, -a)\) respectively, as shown in the figure below. Obtain:

(i) location of the stagnation point(s)

(ii) the velocity components at all points along y-axis in the region between the line sources, i.e. \(-a \leq y \leq +a\).

Q.No. 1(b) Consider air (density = 1.2 kg / m\(^3\)) flowing at \( U_0 = 20 \) m/s past a 50 cm diameter circular cylinder as shown in the figure below. If the cylinder is imparted rotation such that the stagnation points lie on the upper half of the cylinder surface (neglecting the thin viscous layer), estimate using potential flow theory:

\[ \text{contd...} \]
(i) the range of rotational speed in r.p.m for the stagnation point(s) to lie on the upper half surface of the cylinder.

(ii) the sideways / transverse force (magnitude and direction) per unit length of the cylinder corresponding to the maximum rotational speed in part (i).

\[ U = 2a, W \]

\[ + \]

2(a) A symmetrical wedge with a 12° included angle is placed in an airflow in which the Mach Number is 2.3 and the pressure is 60 kPa. If the centreline of the wedge is at an angle of 4° to the direction of flow as shown in figure below, find the pressure difference between the two surfaces of the wedge. \((\gamma = 1.4, C_p = 1.004 \text{ kJ/kg})\)

[Diagram of airflow and wedge]

2(b) Air flows out of a pipe with a diameter of 0.3 m at a rate of 1000 m³/min at a pressure and temperature of 150 kPa and 293 K respectively. If the pipe is 50 m long, find:

(i) Mach number at inlet

(ii) pressure and temperature at pipe inlet.

(Take \(f = 0.005, \gamma = 1.4, C_p = 1.004 \text{ kJ/kg}\))

OR

2'(a) Air flowing at a Mach number of 2.5 passes over a wedge that turns the flow through an angle of 5° as shown in figure below. Find the pressure ratio \(p_2/p_1\) across the oblique shock. If this shock is reflected from a plane surface, find the overall pressure ratio \(p_3/p_1\).

contd... 3
2(b) Air at a temperature of 70°C with a pressure of 200 kPa enters a constant area duct (area = 8 cm²) at a velocity 240 m/s. Neglecting effects of friction, determine:
(i) The maximum amount of heat that can be transferred to the air flow per unit mass of air and corresponding exit temperature.
(ii) The maximum temperature achievable by heat transfer and the corresponding amount of heat transfer in kW for the given inlet conditions. (γ = 1.4, Cp = 1.004 kJ/kg)

3(a) What is the difference between “ensemble average” and “time average” of a turbulent flow variable?

3(b) Consider the flow of air (density = 1.2 kg/m³, absolute viscosity = 18×10⁻⁶ N.s/m²) past a circular cylinder of diameter 50 cm in cross flow as shown in figure below. The approaching stream has a uniform velocity of 50 m/s. Estimate the largest and the smallest length and time scales in the turbulent flow past the cylinder.

3(c) Consider the momentum equations in Cartesian coordinates for an incompressible, isothermal turbulent flow expressed as,

\[ \rho \left[ \frac{\partial u_i}{\partial t} + \frac{\partial u_i u_j}{\partial x_j} \right] = \frac{\partial \tau_{ji}}{\partial x_j} + B_i, \quad i=1,2,3 \quad \text{and} \quad j=1,2,3 \]

Apply Reynolds’s decomposition and time averaging to the momentum equations to
obtain the momentum equations for the mean flow. How many additional unknowns are introduced in the momentum equations for the mean flow?

4(a) Using the Navier-Stokes’s equations for the flow in two dimensions, obtain the transformations of these equations into the vorticity transport form as given below:

\[
\frac{\partial \omega}{\partial t} + u \frac{\partial \omega}{\partial x} + v \frac{\partial \omega}{\partial y} = \nu \left( \frac{\partial^2 \omega}{\partial x^2} + \frac{\partial^2 \omega}{\partial y^2} \right)
\]

4(b) Obtain the governing equations of motion of a fluid near a suddenly moving plane surface (Stokes’s first problem) with a velocity of \( U_0 \). Using appropriate transformations, change the equation into an ODE and obtain the solution in the following form:

\[
u = U_0 \left[ 1 - \left( \frac{2}{\sqrt{\pi}} \right) \int_0^{\eta} \exp(-\eta^2) \, d\eta \right]
\]

where \( \eta = \frac{y}{2\sqrt{v_t}} \)

OR

4(b') In the case of viscous flow of a fluid between two parallel plates with the lower plate fixed and the upper plate moving with a speed of 10 m/s, obtain the value of the pressure gradient for zero flow rate. The separation between the plates is 10 cm. Take the viscosity of the fluid, \( \mu = 6.0 \times 10^{-3} \text{ kg/m/s} \).

5(a) Explain the mechanism of separation of a boundary layer with the help of the profiles of \( u, \partial u/\partial y \) and \( \partial^2 u/\partial y^2 \). What happens to the \( u \)-velocity gradient at the point of separation?

5(b) Using the Blasius transformation of the boundary layer equation for the flat plate at zero angle of incidence, obtain the expression for \( u \) and \( v \) velocity components in the boundary layer.

5(c) For a boundary layer flow over a flat plate of length 1.0 m with main stream velocity of 15 m/s, find the axial velocity \( u \) at a point \( y = 0.001 \text{ m} \) away in \( y \)-direction at a distance of \( x = 0.25 \text{ m} \) from the leading edge. Take \( v = 15 \times 10^{-6} \text{ m}^2/\text{s} \) and for \( \text{Re} = 0.63 \) for \( y = 0.001 \text{ m} \) get \( \delta \).

5(a) Obtain the following form of the von Karman’s momentum-integral equation of the boundary layer:

\[
\tau_0 / \rho = d \left( \frac{U^2 \delta_2}{dx} + \delta_1 U_w \frac{dU_w}{dx} \right)
\]

5(b) Using an approximate \( u \)-velocity profile in the boundary layer over a flat plate at zero angle of incidence of the form:

\[
u / U_w = A + B(y/\delta) + C(y/\delta)^2 + D(y/\delta)^3
\]

obtain the following:

(i) \( \delta, \delta_1 \) and \( \delta_2 \)

(ii) Skin friction coefficient and drag coefficient

\[\text{drag coefficient} = \frac{\tau_0}{\rho U^2}
\]
2013-14
B.TECH. (WINTER END SEMESTER) EXAMINATION
ECONOMICS AND MANAGEMENT
ME 340 | 240

Question

Q No. | Question | M.M.
--- | --- | ---
1(a) | A new piece of materials handling equipment costs Rs. 20,000 and is expected to save Rs. 7500 the first year of operation. Maintenance and operating cost increases are expected to reduce the net saving by Rs. 500 per year for each additional year of operation until the equipment is worn out at the end of 8 years. Determine the net present worth of the equipment at an interest rate of 12 percent. | [5]

1(b) | A 50-kilowatt gas turbine has an investment cost of $40,000. It costs another $14,000 for shipping, insurance, site preparation, fuel lines and fuel storage tanks. The operation and maintenance expense for this turbine is $450 per year. Additionally, the hourly fuel expense for running the turbine is $7.50 per hour, and the turbine is expected to operate 3,000 hours each year. The cost of dismantling and disposing of the turbine at the end of 8 year life is $8000. If the interest rate is 15% per year, what is the annual equivalent life cycle cost of the gas turbine? | [5]

1(c) | State the law of supply and demand? | [2]

OR

1'(a) | Assets A1 and A2 have the capability of satisfactorily performing a required function. Asset A2 has an initial cost of $3200 and an expected salvage value of $400 at the end of its 5 year service life. Asset A1 costs $900 less initially, with an economic life of 10 years, has no salvage value, and its annual operating cost exceed those of A2 by $250. When the required rate of return is 15%, state which alternative is preferred when comparison is by present worth method | [7]

1'(b) | Differentiate between GDP and GNP. | [2]

1'(c) | Explain Elasticity of demand, by giving suitable examples. | [3]

2(a) | At the end of one-half of its expected economic life, a 4-year old machine has a book value of $5800 from its original cost of $9200. Estimated operating costs for next year will amount to $6000. An equipment dealer will allow $3600 if the machine is traded in now and $2800 if it is traded in 1 year later. The dealer proposes the purchase of a new machine to perform the same function; it will cost | [6]
$14,000 installed. This machine will have an estimated operating cost of $4500 per year and a salvage value of $3000 at the end of 4 years. Is it profitable to replace the existing machine now if the minimum return on investments is 15% before taxes?

2(b) A materials testing machine was purchased for $20,000 and was to be used for 8 years with an expected salvage value of $2000. Calculate depreciation charge for year 4 and book value at end of year 3 by using double declining balance method.

2(c) What are the causes and consequences of inflation?

3(a) Is there any difference between managerial roles and managerial skills? Giving suitable examples, explain various managerial skills.

OR

3(a') What are the four basic activities of management? Explain using suitable examples.

3(b) What are the three areas of ethics which may be of special concern for managers?

OR

3(b') What are the arguments for and against social responsibility?

3(c) Discuss the role of information in a manager’s job. What are the various characteristics of useful information?

OR

3(c') Explain the differences between three common methods of group decision making: Interacting groups, Delphi groups and Nominal groups.

4(a) What do you understand by organizational planning? Differentiate among strategic, tactical and operational plans.

4(b) What is the difference between chain of command and span of control?

4(c) How is the leadership different from management? Does an organization need both managers and leaders?

OR

4'(a) What are the various levels of control system in an organization? Explain the four fundamental steps for any control process.

4'(b) What is the importance of employee motivation? Explain the difference between human relation approach and human resource approach.
4(c) What is the concept of job specialization? Compare the benefits and limitations of job specialization.

5(a) Explain exponential smoothing method of demand forecasting. A company has experienced irregular and usually increasing demand for disposable kits. The demand for September was 300 units and for October were 350 units. Using 200 units as September forecast and a smoothing coefficient of 0.7 calculate the forecast for the months of October and November.

5(b) A television manufacturer requires 24,000 two-centimetre-long pieces of wire every month for assembly. Ordering costs are estimated at $42, and cost of carrying is 25 percent of unit price, which is $0.08. Assuming delivery is instantaneous; find the reorder point and economic order quantity.

5(c) Explain the difference between macroeconomics and microeconomics in the context of financial management.