B.TECH. (WINTER SEMESTER) EXAMINATION
MECHANICAL ENGINEERING
MATERIALS SCIENCE
MB-202
Credits: 04
Duration: Three Hours

Maximum Marks: 60

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

Q.NO. | Question | M.M.
--- | --- | ---
1.(a) | What will be the selection criteria for 15 A electrical plugs? | [06]
1.(b) | List the members in the family of <110> directions in the cubic system | [02]
1.(c) | Calculate the magnitude of the Burgers vector for α-Fe and aluminium. Atomic radii of α-Fe and aluminium are 0.124nm and 0.143nm respectively. | [02]
1.(d) | How much 'oversize' the C atom in α-Fe when it is centered interstitially at \( \frac{1}{2} \) \( \frac{1}{2} \) \( \frac{1}{2} \) position (just touching the surface of the iron atom in the centre of unit cell)? | [02]
2. | Write down the composition and properties of the following alloys:
I. Gun metal II. Aluminium Bronze III. Monel metal IV. K-monel V. German Silver VI. Inconel
OR
Prepare a table of aluminium alloys specifying their composition, properties and areas of applications (any six). | [12]
3.(a) | What is heat treatment and for what purpose it is done. Explain the following processes in detail, also discuss the changes in microstructure:
I. Hardening II. Tempering | [06]
3.(b) | Draw and explain the cooling curves for pure metal and alloy. | [06]
4. (a) | A steel specimen is subjected to a tensile loading and is deformed up to a true strain \( \epsilon_1 \). The value of the true stress at \( \epsilon_1 \) was \( \sigma_1 \). Determine the specific energy, \( n \), of the deformed material. | [03]
4. (b) | With a specific example, show why deformation rate, in \( \text{m/s} \), and strain rate are not same? Also, show that deformation rate is proportional to conventional strain rate but not the true strain rate. | [03]
4. (c) | A cable is made of three parallel strands of different materials, all behaving according to the equation \( \sigma = K \epsilon^n \). Their properties and cross-sections are:
Material A: \( K = 600 \text{ MPa}, n = 0.5, A_0 = 5 \text{ mm}^2 \),
Material B: \( K = 400 \text{ MPa}, n = 0.5, A_0 = 4 \text{ mm}^2 \),
Material C: \( K = 400 \text{ MPa}, n = 0.5, A_0 = 3 \text{ mm}^2 \).
I. Calculate the maximum tensile force that this cable can withstand prior to necking.
II. Explain how you would arrive at an answer if the \( n \) values of the three strands were different from each other. | [06]
5. | Define corrosion and differentiate between corrosion and erosion. Explain the following theories related to corrosion:
I. The acid theory II. Chemical attack theory III. Electrochemical theory
OR
Write detailed notes on:
I. Galvanizing II. Tinning III. Inorganic and organic coatings | [12]
2013-14
B.TECH. (WINTER SEMESTER) EXAMINATION
MECHANICAL ENGINEERING
MACHINE DRAWING AND COMPUTER GRAPHICS
ME-211

Maximum Marks: 40
Credits: 04
Duration: Three Hours

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

Q.No. Question

1(a) Draw the conventional representation of the following:

   (i) Rubber           (ii) Plywood
   (iii) Interrupted views (iv) Cylindrical compression spring

1(b) What are various methods of indicating surface roughness in a drawing?

1(c) Show, with suitable illustrations, the method of representation of the following geometrical tolerances in a drawing:

   (i) Straightness (ii) Circularity
   (iii) Parallelism (iv) Perpendicularity

1(d) List the icons on the Modify toolbar in AutoCAD and discuss any five of them.

2 (a) Draw the half sectional elevation and right end view of a Pipe Vice assembly for which the part details are shown in Figure 1.

   OR

2 (b) Assemble the parts and draw the half sectional elevation and Plan of the Plummer Block assembly for which the part details are shown in Figure 2.

   (FIG. ENCLOSED)

   ... 2
Fig. 2: PLUMMER BLOCK
Page 3 of 3
Question

1(a) Discuss types of design regarding design process of a machine element.

OR

1(a') Classify steels. How steels are designated, explain with proper examples.

1(b) Give a brief account of procedures of machine design.

OR

1(b') What do you understand by factor of safety? What are the considerations for selecting a proper factor of safety?

M.M.

2 Answer any two of the following questions.

(a) A cantilever beam made of steel Fe 540 ($S_u = 540 \text{ N/mm}^2$ and $S_y = 320 \text{N/mm}^2$) and subjected to a completely reversed load ($P$) of 5kN as shown in fig. 1. The beam is machined and the reliability is 50%. The factor of safety is 2 and the notch sensitivity factor is 0.9. Calculate:

(i) Endurance limit as the fillet section; and
(ii) Diameter 'd' of the beam for infinite life

(b) A rotating shaft, subjected to a non-rotating force of 5kN and simply supported between two bearings 'A' and 'E' as shown in fig. 2. The shaft is machined from plain carbon steel 30C8 ($S_u = 500 \text{ N/mm}^2$) and the expected reliability is 90%. The equivalent notch radius at the fillet section can be taken as 3mm. What is the life of the shaft?

(c) Define following terms involved in the design of machine elements subjected to variable loads:

(i) Endurance Limit
(ii) Notch Sensitivity

[2x6]
3(a) Derive the expression for tension ratio for a flat belt drive.

OR

3(a') A 15 kW, 960 r.p.m. motor has a mild steel shaft of 40 mm diameter and the extension being 75 mm. The permissible shear and crushing stresses for the mild steel key are 56 MPa and 112 MPa. Design the keyway in the motor shaft extension. Check the shear strength of the key against the normal strength of the shaft.

3(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.

4 Answer any two of the following questions.

(a) A steel plate is subjected to a force of 3 kN and fixed to a vertical channel by the means of four identical bolts as shown in fig. 3. The bolts are made of plain carbon steel 45C8 (S_t = 380 N/mm²) and the factor of safety is 2. Determine the diameter of the shank.

(b) Define power screw and discuss different types of threads used in power screws. Write down advantages of square threads over trapezoidal threads.

(c) Derive the expression for the torque required to lowering the load of a power screw. Explain self-locking and its condition in a power screw.

5 Design and select a flat belt drive of leather on cast iron pulleys to transmit 40 kW, from a synchronous electric motor running at 900 rpm to a centrifugal pump at approximately 300 rpm.
Stress concentration factor (Round shaft with shoulder fillet in bending)

Table 1:

<table>
<thead>
<tr>
<th>Diameter (d) (mm)</th>
<th>kb</th>
</tr>
</thead>
<tbody>
<tr>
<td>d ≤ 7.5</td>
<td>1.00</td>
</tr>
<tr>
<td>7.5 &lt; d ≤ 50</td>
<td>0.85</td>
</tr>
<tr>
<td>d &gt; 50</td>
<td>0.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reliability factor (k_r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
</tr>
<tr>
<td>90</td>
</tr>
<tr>
<td>95</td>
</tr>
</tbody>
</table>
### Table 2: Coefficient of friction for Belts and Pulley material

<table>
<thead>
<tr>
<th>Belt material</th>
<th>Iron, steel</th>
<th>Wood</th>
<th>Paper</th>
<th>Wet rope</th>
<th>Canvas iron</th>
<th>Oily iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oiled (waxed) leather (tempering to 60°C)</td>
<td>0.16</td>
<td>0.3</td>
<td>0.35</td>
<td>0.2</td>
<td>0.31</td>
<td>0.12</td>
</tr>
<tr>
<td>Mineral-laminated leather (tempering to 65°C)</td>
<td>0.4</td>
<td>0.46</td>
<td>0.5</td>
<td>0.25</td>
<td>0.26</td>
<td>0.29</td>
</tr>
<tr>
<td>Canvas stitched, and cotton woven</td>
<td>0.2</td>
<td>0.25</td>
<td>0.25</td>
<td>0.15</td>
<td>0.12</td>
<td>0.16</td>
</tr>
<tr>
<td>Balanced Belting (tempered to 65°C)</td>
<td>0.24</td>
<td>0.25</td>
<td>0.10</td>
<td>0.20</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Rubber covered, and Rubber on Fabric</td>
<td>0.86</td>
<td>0.25</td>
<td>0.18</td>
<td>0.15</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

### Table 3: Service correction factors

<table>
<thead>
<tr>
<th>Atmospheric condition</th>
<th>Clean, situations where the material is not exposed to large losses.</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse</td>
<td>Oily, wet, or dusty</td>
<td>1.0</td>
</tr>
<tr>
<td>Cool</td>
<td>Normal</td>
<td>0.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Angle of contact line</th>
<th>Horizontal to 80° from horizontal</th>
<th>1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>80°–90° from horizontal</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>90°–90° from horizontal</td>
<td>0.8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pulley material</th>
<th>Fibre on wooden and small pulleys</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast iron or steel</td>
<td>Non-critical or continuous</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Intermittent or continuous</td>
<td>0.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak loads</th>
<th>Light, steady loads, such as steam engines, steam turbines, diesel engines, and nongasoline gasoline engines</th>
<th>1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heavy loads, including machines such as motor-generator and power plant motors, and single- and double-cylinder engines.</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Shock and reciprocity loads, full-voltage generator and synchronous motors.</td>
<td>0.8</td>
</tr>
</tbody>
</table>

### Table 4: Standard diameters of Cast iron pulleys

40, 45, 60, 65, 66, 72, 80, 90, 100, 112, 125, 140, 150, 160, 180, 200, 224, 250, 280, 315, 355, 400, 450, 500, 560, 630, 710, 800, 900, 1000, 1120, 1250, 1400, 1600, 1800, 2000.

### Table 5: Leather belt data

- **Specific weight**: 0.01 x 10^3
- **Design strength**: 2 MPa

<table>
<thead>
<tr>
<th>Belt grade</th>
<th>Thickness (mm)</th>
<th>Width-increment (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single ply</td>
<td>Double ply</td>
</tr>
<tr>
<td>Light</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Heavy</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

| Light      | 12–24 by 3    |
| Medium     | 24–102 by 6   |
| Heavy      | 102–198 by 12 |

<table>
<thead>
<tr>
<th>Width-increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>200–800 by 25</td>
</tr>
<tr>
<td>800–1500 by 50</td>
</tr>
<tr>
<td>1500–2100 by 100</td>
</tr>
</tbody>
</table>
2013-14
B.TECH. (WINTER SEMESTER) EXAMINATION
MECHANICAL ENGINEERING
KINEMATICS AND DESIGN OF MACHINES
ME 215

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
1 (a) Explain the Kinematic chain. For a kinematic chain give the relations between
   (i) Number of pairs and number of links (ii) Number of links and number of joints.

1(b) With the help of neat sketch, explain the crank and slotted lever mechanism.

OR

1 (b') A Hooke's joint connects two shafts. The angle between the shafts is 15°. The driving shaft
   rotates uniformly at 1000 rpm. Find the maximum angular acceleration of the driven shaft.

2. The crank of a slider crank mechanism is 150 mm long and connecting rod is 750 mm long. The
   crank rotates at a constant speed of 500 rpm in clockwise direction. Calculate the velocity and
   acceleration of the slider when crank has turned 30° from the inner dead centre position.

OR

2' The crank of a slider crank mechanism is rotating in clockwise direction with a constant angular
   velocity of 30 rad/sec. The length of crank and connecting rod are 200 mm and 750 mm respectively.
   Using Klein's Construction, find (i) The velocity of piston (ii) acceleration of piston, when crank has
   turned 30 from inner dead centre position.

3 (a) Show that for zero collar friction the efficiency of a square thread screw is given by the
   equation.

\[ E = \tan \lambda \left( 1 - \tan \lambda \right) \left( \tan \lambda + \mu \right) \]

3 (b) (i) What do you mean by Locking devices. Name the various locking devices and explain any
   two of them in detail.
   (ii) Derive the relation for eccentric Load on bracket with Circular Base.

   contd ... 2
4 (a) (i) What do you mean by machine design, give its classification. Further discuss the design procedure.
(ii) How the Engineering materials are classified; also discuss the properties of Cast iron which makes it important for engineering purposes.

4 (b) Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter 40 mm and length 1.65 m, if the longitudinal strain in the bar during tensile test is Four times the lateral strain. Find also the change in volume, when the bar is subjected to hydrostatic pressure of 110 N/mm². Take \( E = 1 \times 10^5 \) N/mm².

OR

4'(a) (i) Discuss how the combined steady and variable stress may be determined. Explain the Goodman Method for combination of stresses.
(ii) What is Notch Sensitivity? Also derive the relation for the same.

4'(b) A rotating shaft is supported in ball bearings as shown in Fig (i). The shaft is loaded by a non rotating force of 7.5 KN. Determine the life of the part by taking the following values. Sut = 700 MPa, S_y = 340 MPa, the surface finish factor as 0.75 and the size factor 0.89, Theoretical stress concentration factor \( K_1 = 1.65 \) and notch sensitivity factor \( c = 0.85 \)

5 (a) Explain and derive the relations for any two of the following.
(i) Length of Path of Contact.
(ii) Interference in involute gears.
(iii) Epicyclic Gear train.

5 (b) Two mating gears of 20° pressure angle having a gear ratio of 2. The numbers of teeth on the pinion are 18. The module of the pitch is 10 mm. If the addendum on each wheel is such that the path of approach and path of recess on each side is half of the maximum possible length each, determine (i) The addendum height for pinion and gear (ii) The length of path of contact (iii) The length of Arc of Contact.
1(a) Explain the difference in any two of the following.
   i. Type I and Type II error
   ii. Systematic and Random error
   iii. Precision and Accuracy
   iv. Discrete and Continuous random variable

1(b) The two resistors $R_1$ and $R_2$ are connected in series. The voltage drops across each resistor are measured as

   $E_1 = 10 \text{ V} \pm 0.1 \text{ V (1\%)}$
   $E_2 = 1.2 \text{ V} \pm 0.005 \text{ V (0.467\%)}$ along with a value of $R_2 = 0.0066 \Omega \pm 3\%$

1(c) A certain type of storage battery lasts, on average, 3.0 years, with a standard deviation of 0.5 year. Assuming that the battery lives are normally distributed, find the probability that a given battery will last less than 2.4 years, and also find the probability that a given battery will last between 2.3 and 3.7 years.

OR

1(a) Let $X$ denote the number of times a certain numerical control machine will malfunction 1, 2, or 3 times on any given day. Let $Y$ denote the number of times a technician is called on an emergency call. Their joint probability distribution is given as:

<table>
<thead>
<tr>
<th>$f(x,y)$</th>
<th>$x$</th>
<th>2</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>0.10</td>
<td>0.15</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>0.20</td>
<td>0.30</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>0.10</td>
<td>0.15</td>
</tr>
</tbody>
</table>
Question

I(a) The three resistors $R$, $R'$ and $R_0$ are connected as shown in the accompanying figure. Voltage drop across each resistor are measured as:

\[ V = 10V \pm 0.1V \]
\[ R = 1.2 \Omega \pm 0.005 \Omega \]
along with a value of $R_0 = 0.0066 \Omega \pm 1/4\%$.

From these measurements determine the power dissipated in any resistor ‘$R$’ and its uncertainty.

I(b) A manufacturer knows that on the average 2% of the electric toasters that he makes will require repairs within 90 days after they are sold. Use normal approximation to the binomial distribution to determine the probability that among 1200 of these toasters at least 35 will require repairs within the first 90 days after they are sold.

I(c) Find the value of $F_{0.05}$ for $v_1 = 6$ & $v_2 = 20$.

OR

I'(a) If two random variables have the joint density

\[ f(x, y) = \begin{cases} x^2 y & \text{for } 0 < x < 1, 0 < y < 2 \\ 0 & \text{elsewhere} \end{cases} \]

Find the expressions for $f(x|y)$ for $0 < y < 1$ and $f(x|y=1/2)$

I'(b) Adding graphite to iron can improve its ductile qualities. If measurements of the diameter of graphite spheres within an iron matrix can be modelled as a normal distribution having standard deviation of 0.16, what is the probability that the mean of a sample of size 36 will differ from the population mean by more than 0.06?

I'(c) Find the value of $F_{0.05}$ for $v_1 = 12$ & $v_2 = 15$. 

Contd......2
Evaluate $E(X)$ and $E(Y)$ for distributions of $X$ & $Y$

1(b) In the inspection of tin plate produced by a continuous electrolytic process, 0.2 imperfection is spotted on the average per minute. Find the probabilities of spotting i. at least two imperfection in 5 minutes ii. at most one imperfection in 15 minutes

2(a) A manufacturer produces electric irons. The thermostats were to be tested on iron on the 550°F setting, and the actual temperature were to be read. The data are as follows:
550.3, 539.8, 550.1, 540.8, 555.4, 560.1, 551.2, 549.1
Draw the normal score plot to test the normality of the data.

2(b) The following data were collected to determine the relationship between pressure and the corresponding scale reading for the purpose of calibration:

<table>
<thead>
<tr>
<th>Pressure (x)</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale reading (y)</td>
<td>13</td>
<td>16</td>
<td>20</td>
<td>86</td>
<td>92</td>
</tr>
</tbody>
</table>

(i) Find the equation of the regression line using least square method.
(ii) Calculate the Pearson correlation coefficient.
(iii) Estimate mean square error.

3(a) What is meant by Impedance Loading of instruments?

3(b) Formulate the system equation for a force-measuring Spring Scale. Assume total mass as $M$ (kilograms), linear spring with spring constant $K_s$ (Newton per meter) and viscous damping effect with constant $B$ (Newton per meter per second). Also, with the help of the above governing equation, find out the output response of the second order instrument for the harmonic input signal of the form $x(t) = X_s \sin\omega t$, where $X_s$ is the amplitude and $\omega$ the circular frequency of the harmonic input.

OR

3(b') A thermocouple with a time constant of 0.3 sec and a static sensitivity of 0.04 mV/°C is suddenly immersed in a bath of hot oil, which is at 100°C. The initial temperature of the thermocouple measuring and reference junctions was 25°C.

(i) Write the governing equation of the thermocouple and find the output at time
2(a) The mean weight loss of \( n = 16 \) grinding balls after a certain length of time in mill slurry is 3.42 grams with standard deviation of 0.68 grams. Construct a 99% confidence interval for the true mean weight loss of such grinding balls under the stated conditions.

2(b) The following show the improvement (gain in reading speed) of six students in a speed reading program, and the number of weeks they have been in the program:

<table>
<thead>
<tr>
<th>Number of weeks</th>
<th>3</th>
<th>5</th>
<th>2</th>
<th>8</th>
<th>6</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed gain</td>
<td>86</td>
<td>118</td>
<td>49</td>
<td>193</td>
<td>164</td>
<td>232</td>
</tr>
</tbody>
</table>

(words/minute)

Compute the following:

i. Estimate of linear regression \( \hat{y} = \alpha + \beta x \)

ii. Mean squared error \( s_e^2 \)

iii. Correlation coefficient \( r \)

3(a) A force sensor has an input range of 0 to 10 kN and an output range of 0 to 5 V at a standard temperature of 20 °C. At 30 °C, the output range is 0 to 5.5 V. Quantify this environmental effect.

3(b) A measuring instrument with a time constant of 0.4 s and a static sensitivity of 0.01 mV/°C is used to measure the temperature of a medium, which changes from 15 to 80 °C. Taking the output as zero at 15 °C, find the time taken for the output to reach 70% of the steady-state value, if the temperature change occurs suddenly.

3(c) An elastic force sensor has an effective seismic mass of 0.1 kg, a spring stiffness of 10 N/m and a damping constant of 14 N·s/m. Calculate

(i) Sensor natural frequency

(ii) Sensor damping ratio

(iii) Transfer function relating displacement and force

OR

3'(c) Give examples of the following types of instruments along with precise explanation:

1. Passive type instrument.
2. Null type instrument.
3. Proximity type instrument.
4. Intelligent type instrument.

Contd......3
0.1, 0.3 and 1.0 sec.

(ii) Design a compensating circuit to be used along with the thermocouple so that the time constant is reduced to half its value. For this system, find the output at time, given in (i).

4 Write short notes on any three (03) of the following:

(i) Linear Variable Differential Transformer and its applications in measurement systems.
(ii) Different types of photoelectric transducers.
(iii) Laser Jet Printers
(iv) Digital to Analog Converters

5 Answer any three (04) of the following:

I. Explain the use of strain gauges for the measurement of torque with schematic diagram.
II. Explain how the proving ring is used for force measurement.
III. Name at least four thermocouple combinations. What happens when a number of thermocouples are connected in series? Or when they are connected in parallel?
IV. Turbine Flowmeter
V. Pirani Thermal Conductivity Gage
4(a) An iron v. constantan (type J) thermocouple used between 0 and 500 °C has the following input-output characteristics:

<table>
<thead>
<tr>
<th>Input T °C</th>
<th>0</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output E µV</td>
<td>0</td>
<td>5268</td>
<td>10,777</td>
<td>16,325</td>
<td>27,388</td>
</tr>
</tbody>
</table>

(i) Find the equation of the ideal straight line.
(ii) Find the non-linearity at 100 °C and 500 °C in µV and as a percentage of f.s.d.

4(b) A variable dielectric capacitive displacement sensor consists of two square metal plates of side 5 cm, separated by a gap of 1 mm. A sheet of dielectric material 1 mm thick and of the same area as the plates can be slid between them as shown in the figure. Given that the dielectric constant of air is 1 and that of the dielectric material 4, calculate the capacitance of the sensor when the input displacement x = 0.0, 2.5 and 5.0 cm.

4(b) Briefly describe with the help of a diagram:
(i) Cathode Ray Tube Display
(ii) Digital to Analog Converter

5. Give brief description on any four (04) of the following:
   i. Force measurement using strain gauge
   ii. Application of proxy brake for torque measurement
   iii. Flow measurement using venturi meter
   iv. McLeod Pressure Gauge
   v. The five 'laws' of thermocouple behaviour which are vital in temperature measurement.
2013-14
B.TECH. (WINTER END SEMESTER) EXAMINATION
ECONOMICS AND MANAGEMENT
MF 540 / 240

Maximum Marks: 60
Credits: 04
Duration: Three Hour

Q.No. Question M.M. 1

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
$14,000 installed. This machine will have an estimated operating cost of $4,500 per year and a salvage value of $3,000 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.