Code :9A03303 **1**

II B.Tech I Semester (R09) Regular Examinations, November 2010
MACHINE DRAWING
(Mechanical Engineering)

Time: 4 hours **Max Marks: 70**

Answer all questions
All answers should be on drawing sheet only.
Answers on the drawing sheet only will be valued.
First angle projection to be adopted.

⋆ ⋆ ⋆ ⋆ ⋆

1. Answer any two of the following: [4x2]

   (a) Sketch the conventional representation of the following materials:
   i) steel ii) glass iii) wood iv) cement

   (b) Draw the following made on a metal piece
   i) HOLE DIA 20 C BORE DIA 30 DEEP 12 ii) DIA 28 CSK DIA 35

   (c) Draw the front view and top view of a hexagonal nut and mark proportions in terms of nominal diameter 'D'.

2. Answer any two of the following: [10x2]

   (a) Draw two views of the following types of keys in position. Choose shaft diameter as 30 mm and hub diameter as 60 mm.
   i) wood ruff key and ii) parallel sunk key.

   (b) Draw the sectional view from the front and view from the top of the double riveted double strap chain butt joint with dia of the rivet as 16 mm.

   (c) Draw the half sectional view from the front (top half in section) and view from the left of a solid flanged coupling to connect two shafts of diameter 'D' and mark proportions on the views.

3. Details of screw jack are shown in fig. assemble all the parts and provide the following views of the assembled screw jack. Half sectional view from the front (right half in section), view from the top and view from the right. Also provide the part list. [42x1]

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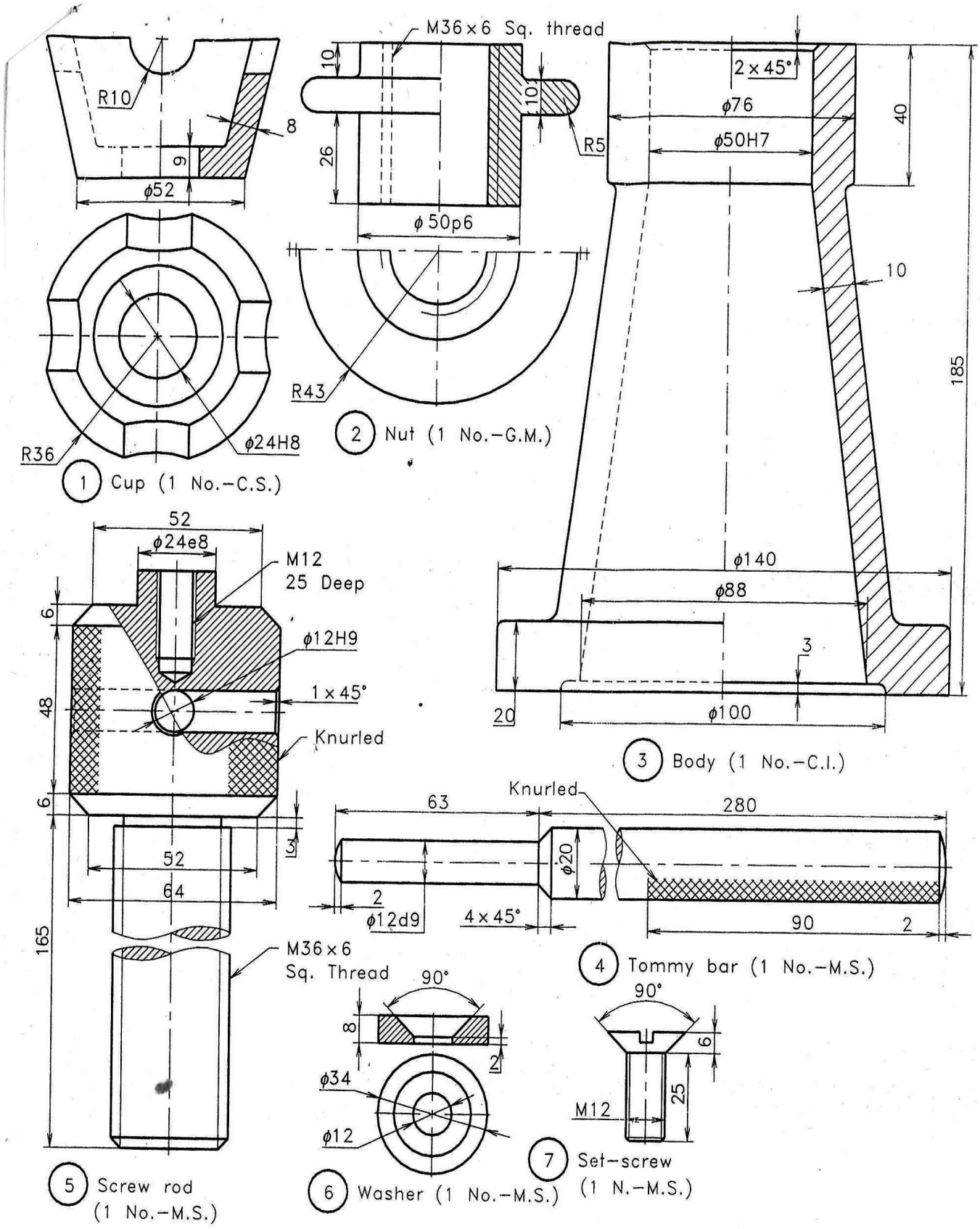
R10
8
9
φ52
1 Cup (1 No.–C.S.)
R36
φ24H8
M36×6 Sq. thread
10
110
26
φ50p6
R43
2 Nut (1 No.–G.M.)
2×45°
φ76
φ50H7
R5
40
10
185
φ140
φ88
3
20
φ100
3 Body (1 No.–C.I.)
52
φ24e8
M12
25 Deep
6
φ12H9
48
1×45°
Knurled
6
13
52
64
165
M36×6
Sq. Thread
5 Screw rod
(1 No.–M.S.)
63
Knurled
280
φ20
2
φ12d9
4×45°
90
2
4 Tommy bar (1 No.–M.S.)
90°
8
2
φ34
φ12
6 Washer (1 No.–M.S.)
90°
6
M12
25
7 Set-screw
(1 N.–M.S.)

Code :9A03303 **2**

II B.Tech I Semester (R09) Regular Examinations, November 2010
MACHINE DRAWING
(Mechanical Engineering)

Time: 4 hours **Max Marks: 70**

Answer all questions
All answers should be on drawing sheet only.
Answers on the drawing sheet only will be valued.
First angle projection to be adopted.

⋆ ⋆ ⋆ ⋆ ⋆

1. Answer any two of the following: [4x2]
   (a) Sketch the conventional representation of the following:
   i) Square on shaft ii) Holes on circular shaft
   (b) Show by sketches
   i) Parallel dimensioning ii) Chain dimensioning
   (c) Sketch the internal and external ISO metric thread profile of nominal size 30 X 3 mm, to a scale of 10:1.

2. Answer any two of the following: [10x2]
   (a) Draw the sectional view from the front and view from the side of a cottered joint with a gib to connect two square shafts of 40 mm side each.
   (b) Draw the sectional view from the front and view from the top of the double riveted double strap zig-zag butt joint with dia of the rivet as 16 mm.
   (c) Draw the half sectional view from the front (Left half in section) and view from the above of a solid journal bearing to support a shaft of diameter 'D' and mark proportions on the views.

3. Details of a connecting rod are shown in the fig. Assemble all the parts and provide the 42 following views of the assembled connecting rod. (neglect the tolerance notes). Half sectional view from the front (top half in section), view from the top and view from the right. Also provide the part list. [42x1]

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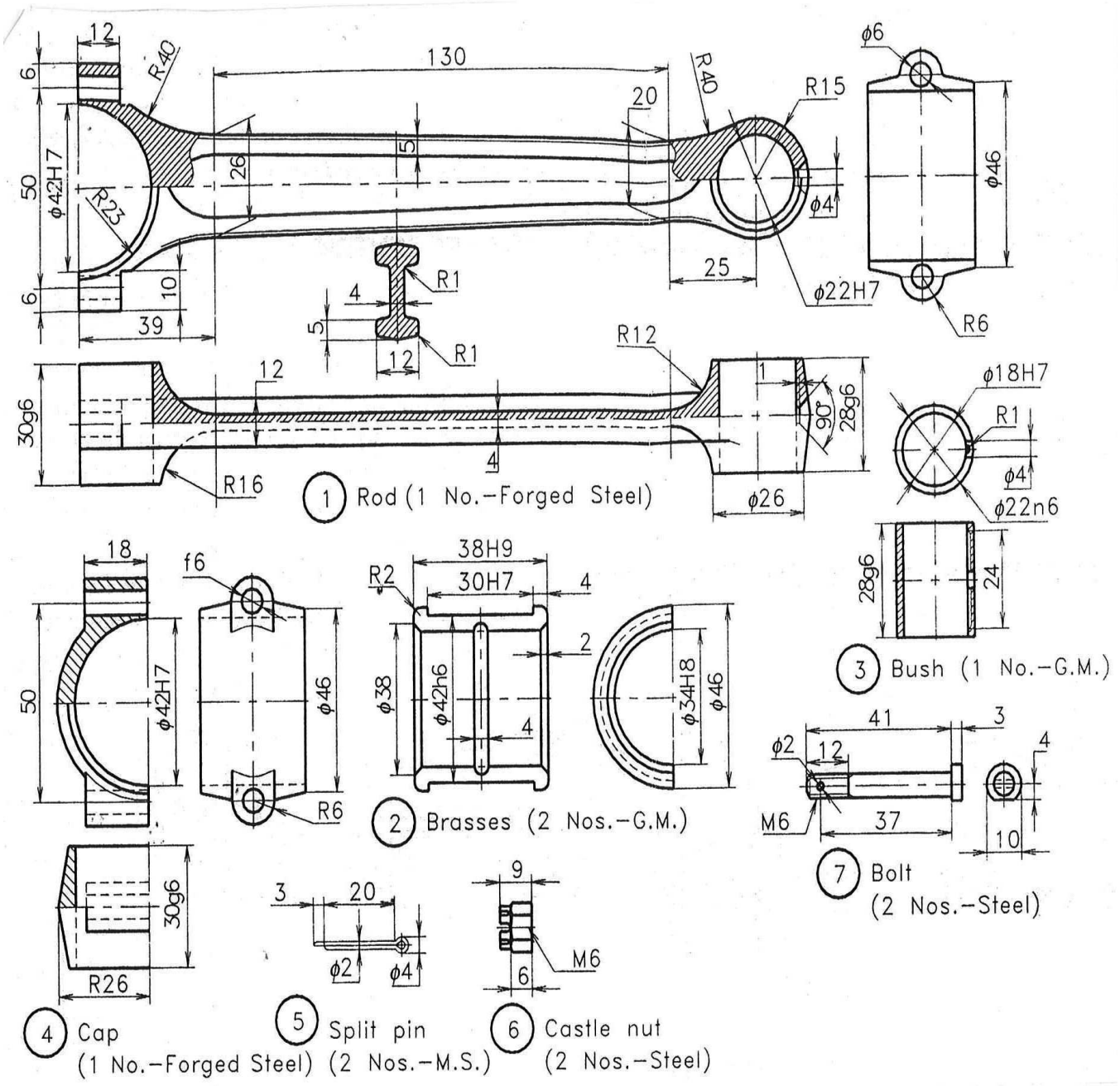
12
6
R40
130
R40
20
R15
φ6
50
φ42H7
R23
26
5
φ4
φ46
6
10
39
25
φ22H7
R6
4
R1
5
12
R1
R12
12
1
30g6
28g6
90°
φ18H7
R1
4
φ4
R16
φ26
φ22n6
1 Rod (1 No.–Forged Steel)
18
f6
38H9
R2
30H7
4
2
28g6
24
50
φ42H7
φ46
φ38
φ42h6
φ34H8
φ46
4
R6
3 Bush (1 No.–G.M.)
2 Brasses (2 Nos.–G.M.)
41
3
φ2
12
4
M6
37
10
7 Bolt
(2 Nos.–Steel)
30g6
3
20
9
M6
R26
φ2
φ4
6
4 Cap
(1 No.–Forged Steel)
5 Split pin
(2 Nos.–M.S.)
6 Castle nut
(2 Nos.–Steel)

Code :9A03303 **3**

II B.Tech I Semester (R09) Regular Examinations, November 2010
MACHINE DRAWING
(Mechanical Engineering)

Time: 4 hours **Max Marks: 70**

Answer all questions
All answers should be on drawing sheet only.
Answers on the drawing sheet only will be valued.
First angle projection to be adopted.

⋆ ⋆ ⋆ ⋆ ⋆

1. Answer any two of the following: [4x2]

   (a) Sketch the conventional representation of the following:
   i) Splined shaft ii) Cylindrical compression spring

   (b) Show by sketches
   i) dimensioning of chamfers ii) dimensioning of counter sinks

   (c) Sketch the following thread profiles for a nominal size of 30 X 3 mm, to a scale of 10:1.
   i) BSW thread ii) Square thread

2. Answer any two of the following: [10x2]

   (a) Draw three views of a hexagonal headed bolt of nominal diameter 30 mm and length 100mm; with a hexagonal nut and washer.

   (b) Draw the half sectional view from the front and view from the side of a cottered joint with sleeve to connect two shafts of 40 mm dia.each

   (c) Draw the sectional view from the front (left half in section) and view from the above of a bushed journal bearing to support a shaft of diameter 'D' and mark proportions on the views.

3. Details of a cross head are shown in the fig. Assemble all the parts and provide the following views of the assembled cross head. (neglect the tolerance notes). Half sectional view from the front (left half in section), view from the bottom and view from the left. Also provide the part list. [42x1]

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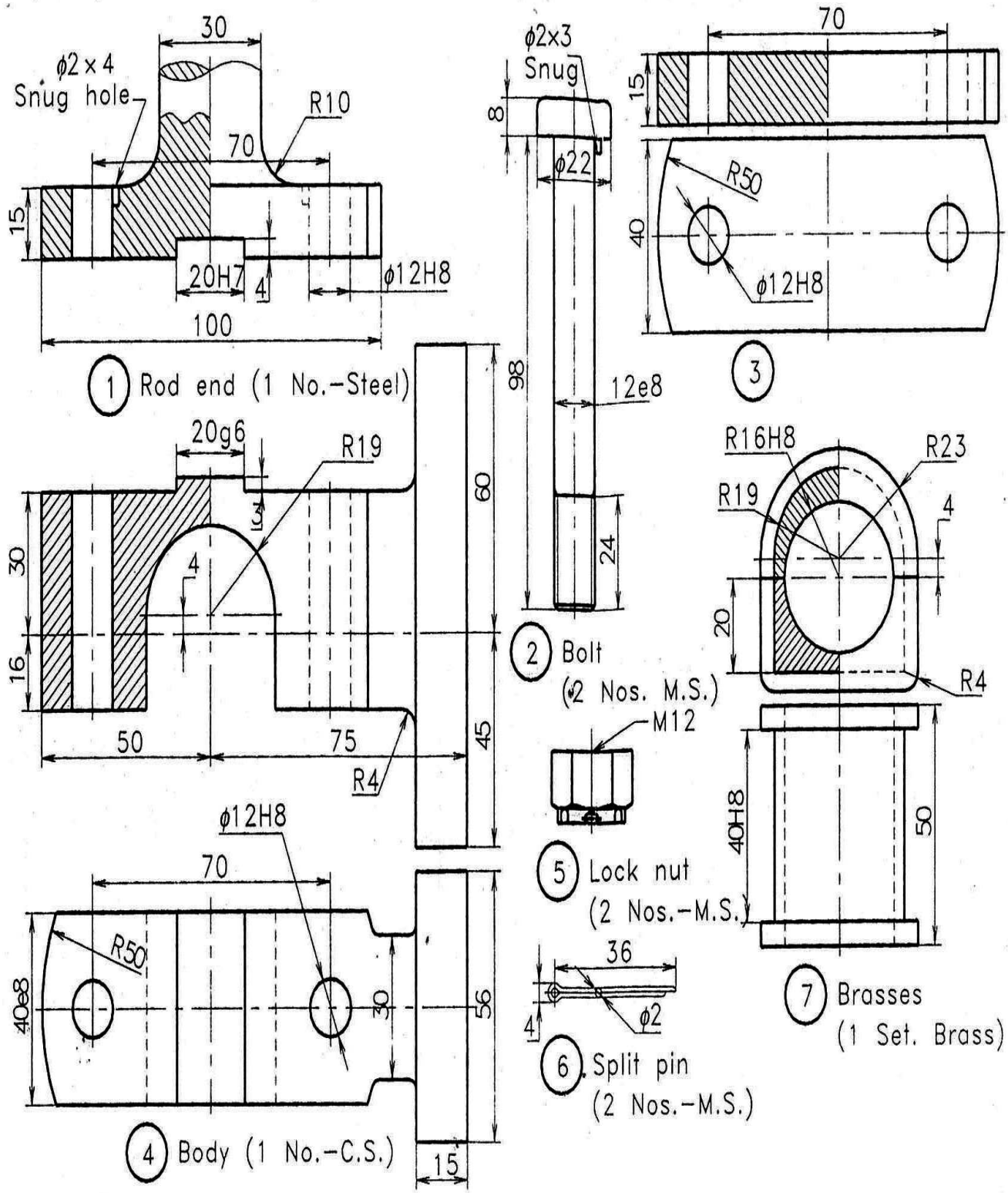


Cross-head (vertical type) parts.

Code :9A03303 4

II B.Tech I Semester (R09) Regular Examinations, November 2010
MACHINE DRAWING
(Mechanical Engineering)

Time: 4 hours **Max Marks: 70**

Answer all questions
All answers should be on drawing sheet only.
Answers on the drawing sheet only will be valued.
First angle projection to be adopted.

⋆ ⋆ ⋆ ⋆ ⋆

1. Answer any two of the following: [4x2]

   (a) Sketch the conventional representation of the following materials:
   i) bronze ii) cast iron iii) gravel iv) plywood

   (b) Show by sketches, dimensioning of tapered features
   i) external and ii) internal

   (c) Sketch the following thread profiles for a nominal size of 30 X 3 mm, to a scale of 10:1.
   i) Buttress thread ii) ACME thread.

2. Answer any two of the following: [10x2]

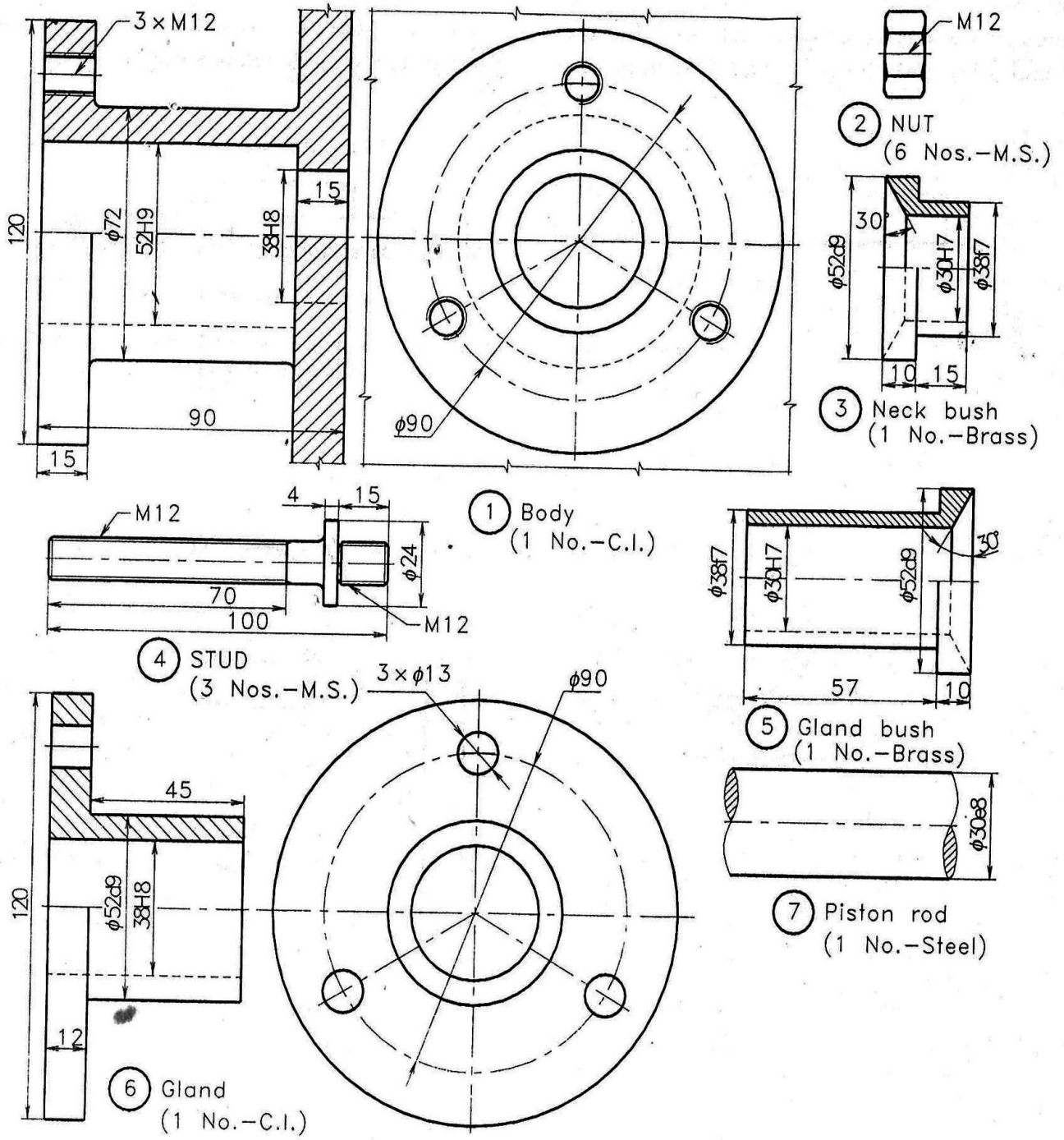
   (a) Draw three views of a hexagonal headed bolt of nominal diameter 30 mm and length 100mm; with a square nut and a washer.

   (b) Draw the half sectional view from the front (top half in section) and view from the left of a simple flanged coupling to connect two shafts of diameter 'D' and mark proportions on the views.

   (c) Draw the half sectional view from the front (top half in section) and view from the left of a socket and spigot joint connecting two pipes of diameter 'D' and mark proportions on the views.

3. Details of stuffing box are shown in the fig. Assemble all the parts and provide the following views of the assembled stuffing box. (neglect the tolerance notes). Half sectional view from the front (right half in section), view from the top and view from the left. Also provide the part list. [42x1]

⋆ ⋆ ⋆ ⋆ ⋆



Stuffing box (three bolt type) parts.

Code :9ABS301 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICS-II
(Aeronautical Engineering, Bio Technology, Civil Engineering, Mechanical Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Solve completely the system of equations
$x + 3y - 2z = 0,\ 2x - y + 4z = 0,\ x - 11y + 14z = 0$.
(b) Find the eigen values and eigen vectors of $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$.

2. Discuss the nature of quadratic forms and reduce it to canonical form
$x_1^2 + 2x_2^2 + 3x_3^2 + 2x_1x_2 - 2x_1x_3 + 2x_2x_3$.

3. (a) Find the fourier series of the periodic function defined as $f(x) = \begin{cases} -\pi, -\pi < x < 0 \\ x,\ 0 < x < \pi \end{cases}$
Hence deduce that $1/1^2 + 1/3^2 + 1/5^2 + ... = \pi^2/8$
(b) Express $f(x) = x$ as a fourier series in $(-\pi, \pi)$.

4. (a) Show that the fourier transform of $e^{-x^2/2}$ is reciprocal.
(b) Find the fourier sine and cosine transform of $f(x) = \frac{e^{-ax}}{x}$ and deduce that
$\int_0^\infty \frac{e^{-ax} - e^{-bx}}{x} \sin sx dx = \tan^{-1}(s/a) - \tan^{-1}(s/b)$

5. (a) Form the partial differential equation by eliminating the arbitrary functions from
$z = xf_1(x+t) + f_2(x+t)$.
(b) If a string of length l is initially at rest in equilibrium position and each of its points is given,the velocity $(\partial y/\partial x)_{t=0} = b\sin^3(\pi x/l)$ find the displacement y(x,t).

6. (a) Find a real root of $x + \log_{10} x - 2 = 0$ using Newton Raphson method.
(b) Use Gauss's backward interpolation formula to find $f(32)$ given that
$f(25) = 0.2707, f(30) = 0.3027, f(35) = 0.3386, f(40) = 0.3794$.

7. (a) Fit a straight line for the following data.

X	6	7	7	8	8	8	9	9	10
y	5	5	4	5	4	3	4	3	3

(b) Fit a second degree polynomial to the following data by the method of least squares

X	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

8. (a) Solve $y^1 = y - x^2, y(0) = 1$, by Picard's method upto the fourth approximation. Hence, find the value of $y(0.1), y(0.2)$.
(b) Find $y(0.1)\ and\ y(0.2)$ using Range -Kutta 4^{th} order formula given that $y^1 = x^2 - y$, and $y(0) = 1$.

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Code :9ABS301 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICS-II
(Aeronautical Engineering, Bio Technology, Civil Engineering, Mechanical Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Reduce the matrix $A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ to the normal form and find its rank.
   (b) Solve the system of equations
   $x + 2y + 3z = 1$
   $2x + 3y + 8z = 2$
   $x + y + z = 3$

2. Find the eigen vectors of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ and hence reduce $6x^2 + 3y^2 + 3z^2 - 2yz + 4zx - 4xy$ to a sum of squares .

3. (a) Represent the following function by fourier sine series $f(x) \begin{cases} x, & for \quad 0 < x < \pi/2 \\ \pi/2, & for \quad \pi/2 < x < \pi \end{cases}$
   (b) Expand $f(x) = e^{-x}$ as a fourier series in the interval (-1,1).

4. (a) Find the fourier transform of $f(x) = \begin{cases} a^2 - x^2, \text{if } |x| < a \\ 0, if\ |x| > a > 0 \end{cases}$
   (b) Hence show that $\int_0^\infty \frac{\sin x - \cos x}{x^3} dx = \pi/4$

5. (a) Form the partial differential equation by eliminating the arbitrary function f from $xy + yz + zx = f\left(\frac{z}{x+y}\right)$.
   (b) Find the harmonic temperature distribution $F(r, \theta)$ inside the circle $|z| = 1$ taking values
   $F(1, \theta) = T, 0 \le \theta \le \pi$
   $= \text{T}, \pi \le \theta \le 2\pi$
   On the circumference, assuming that the plate is laterally insulated.

6. (a) Find Y(25) given that $y_{20} = 24, y_{24} = 32, \text{y}_{28} = 35, \text{y}_{32} = 40$ using Gauss forward difference formula.
   (b) Find the unique polynomial p(x) of degree 2 or less such that $P(1) = 1, P(3) = 27, P(4) = 63$ using Lagrange interpolation formula.

7. (a) Derive the normal equations to fit a straight line $y = a + bx$.
   (b) Fit the curve $y = ae^{bx}$ to the following data

x	0	1	2	3	4	5	6	7	8
y	20	30	52	77	135	211	326	550	1052

8. Tabulate $y(0.1), y(0.2) and y(0.3)$ using Taylor's series method given that $y^1 = y^2 + x$ and $y(0) = 1$.

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Code :9ABS301 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICS-II
(Aeronautical Engineering, Bio Technology, Civil Engineering, Mechanical Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Solve by matrix method the equations $3x + 4y + 2z = 3$, $2x - 3y - z = 3$, $x + 2y + z = 4$
   (b) Test the consistency of $x + y + z = 1, x - y + 2z = 1, x - y + 2z = 5$, $2x - 2y + 3z = 1, 3x + y + z = 2$.

2. Reduce the quadratic form $8x^2 + 7y^2 + 3z^2 - 12xy - 8yz + 4zx$ into a sum of squares by an orthogonal transformation and give the matrix of transformation. Also state the nature.

3. (a) Find the fourier series to represent $f(x) = x^2 - 2$ when $-2 \leq x \leq 2$.
   (b) Find half - range fourier sine series for $f(x) = ax + b$, in $0 < x < 1$.

4. (a) Find the fourier cosine transform of e^{-ax} cosax.
   (b) Evaluate $\int_0^\infty \frac{x^2}{(a^2+x^2)^2} dx$ (a > 0) using Parseval's identity.

5. (a) Form the partial differential equation by eleminating the arbitrary function from $z = yf(x^2 + z^2)$.
   (b) Solve by the method separation of variables $2xz_x - 3yz_y = 0$.

6. (a) Find an approximate value of the real root of $x^3 - x - 1 = 0$ by bisection method.
   (b) Show that $\Delta f_i^2 = (f_i + f_i + 1)\Delta f_i$.

7. (a) Fit a straight line to the form y=a+bx for the following data

x	0	5	10	15	20	25
y	12	15	17	22	24	30

   (b) Fit the curve $y = ae^{bx}$ to the following data

x	0	1	2	3	4	5	6	7	8
y	20	30	52	77	135	211	326	550	1052

8. Find $y(0.1)$ and $y(0.2)$ using Euler's modified formula given that $dy/dx = x^2 - y, y(0) = 1$

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Code :9ABS301 **4**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATHEMATICS-II
(Aeronautical Engineering, Bio Technology, Civil Engineering, Mechanical Engineering)
Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Find the rank of $\begin{bmatrix} 1 & 4 & 3 & -2 & 1 \\ -2 & -3 & -1 & 4 & 3 \\ -1 & 6 & 7 & 2 & 9 \\ -3 & 3 & 6 & 6 & 12 \end{bmatrix}$

   (b) Solve the system of equations $3x + y + 2z = 3, 2x - 3y - z = -3, x + 2y + z = 4$.

2. Reduce the quadratic form of canonical form by an orthogonal reduction and state the nature of the quadratic form $2x^2 + 2y^2 + 2z^2 - 2xy - 2yz - 2zx$.

3. (a) Obtain the fourier series expansion of $f(x)$ given that $f(x) = (\pi - x)^2$ in $0 < x < 2\pi$ and deduce the value of $1/1^2 + 1/2^2 + 1/3^2 + ...= \pi^2/6$.

   (b) Expand $f(x) = \cos x$, $0 < x < \pi$ in half range sine series.

4. (a) Find the Fourier sine transform of $\frac{x}{a^2+x^2}$ and Fourier cosine transform of $\frac{1}{a^2+x^2}$.

   (b) Using passeval's identity, show that $\int_0^\infty \frac{dx}{(x^2+a^2)(b^2+y^2)} = \frac{\pi}{2ab(a+b)}$.

5. (a) Solve $(x + pz)^2 + (y + qz)^2 = 1$.

   (b) Find the temperature in a thin metal rod of length l with both the ends insulated and with initial temperature in the rod is $\sin(\pi x/l)$.

6. (a) Find a real root of $xe^x = 2$ using Regular falsi method.

   (b) Using Newton -Raphson's method, find a positive root of $\cos x - xe^x = 0$.

7. (a) Fit a straight line to the form $y = a + bx$ for the following data :

x	0	5	10	15	20	25
y	12	15	17	22	24	30

   (b) Derive the normal equation to fit the parabola $y = a + bx + cx^2$.

8. (a) Using Euler's method, solve numerically the equation,$y^1 = x + y, \mathrm{y}(0) = 1,$ for $x = 0.0, 0.2, 1.0$.

   (b) Find $y(0.1)$ and $y(0.2)$ using Runge-Kutta 4^{th} order formula given that $y^1 = x^2 - y$ and $y(0) = 1$.

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Code 9A01301 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
MECHANICS OF SOLIDS
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Prove $E = 3K\left(1-\frac{2}{n}\right)$
   (b) An aluminium bar 60mm diameter when subjected to an axial tensile load 100KN elongates 0.20mm in a guage length 300mm and the diameter is decreased by 0.012mm. Calculate the modulus of elasticity and the poisson's ratio of the material .

2. (a) Define the following :
      i. Bending Moment.
      ii. Shear force.
      iii. Point of contraflexure.
   (b) A cantilever beam of length 2m carries an uniformly distributed load of 3KN/m over a length of 1.5m from its fixed end and a point load 5 KN at its free end. Draw the shear force and bending moment diagrams.

3. Define Neutral axis. Sketch the bending stress distribution across the cross section of a rectangular beam section 230 × 400 mm subjected to 60KNm moment.

4. (a) Circular beam of 120mm diameter is subjected to a shear force of 7KN. Calculate
      i. Average shear stress.
      ii. Maximum shear stress.
      Also sketch the variation of the shear stress along the depth of the beam.
   (b) From first principles derive the expression for shear stress at any point in any cross-section of a beam which is subjected to a shear force F.

5. (a) What is moment area method? Explain the two Mohr's theorems, as applicable to the slope and deflection of a beam.
   (b) A cantilever of uniform cross-section of length l carriers two point loads, w at the free end 2W at a distance a from the free end. Find the maximum deflection due to this loading.

6. (a) A solid shaft has to transmit 75 KW at 200rpm. Taking allowable shear stress as $75N/m^2$, find suitable diameter for the shaft, if the maximum torque transmitted on each revolution exceed the mean by 25%.
   (b) A closed coiled helical spring made of 6mm diameter steel wire has 20 coils, each of 100mm mean diameter, when subjected to axial loads of 70N, Calculate
      i. The maximum shear stress produced
      ii. The deflection
      iii. The energy stored.

7. Define the terms :
   (a) Circumferential stress.
   (b) Longitudinal stress and derive the expressions for the same in thick cylinder.

8. The external diameter of a steel colar is 200mm, and the internal diameter increases by 0.125mm when shrunk onto a solid steel shaft of 125mm diameter. Find the reduction in diameter of the shaft, the radial pressure between the collar and the shaft and hoop stress at the inner surface of the tube. Take E = 210 GN/m^2 and poisons ratio = 0.3.

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Code 9A01301 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
MECHANICS OF SOLIDS
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Derive a relation for the deformation of a body, when subjected to
   i. Tensile force
   ii. Its own weight
   (b) A steel bar $40mm \times 40mm$, 3000mm long is subjected to an axial pull of 128KN. Taking $E = 2 \times 10^5 N/m^2$ and poisson's ratio if 0.3. Calculate the alterations in the length and side of the bar during extension.

2. (a) Define the 'Beam' and the type of action and deformation it undergoes.
   (b) Draw the S.F and B.M diagram for a simply supported beam of span Lm loaded with UDL of wKN/m.

3. A timber beam of rectangular section is to support a load of 20KN/m over a span of 5m. If the depth of the section is to be twice the breadth, and the stress in the timber is not to exceed 50N/mm^2 , find the dimensions of the cross-section. How would you modify the cross-section of the beam if it were a concentrated load placed at the centre with the same ratio of breadth to depth?

4. (a) What do you mean by shear stress in beams ?
   (b) From first principles derive the expression for shear stress of any point in any cross-section of a beam which is subjected to a shear force F.

5. A 6.5m long cantilever carries a uniformly distributed load over the entire length. If the slope at the free end is 1^0 (one degree) , what is the deflection at the free end?

6. A shaft transmits 300Kw power at 120rpm. Determine the necessary diameter of solid circular shaft and the necessary diameter of hollow circular section, the inside diameter being 2/3 of the external diameter. The allowable shear stress is 70N/mm^2 . Taking the density at material as 77N/m^3 , calculate the % saving in the shaft if hollow shaft is used.

7. (a) Derive the expansion for the change of diameter and length of a thin cylindrical shell subjected to an internal pressure.
   (b) A cylindrical shell 2.4m long 0.6m in diameter is made up of 12mm thick plate .Find the change in the length & diameter when the shell is subjected to an internal pressure of 2N/mm^2 . Young's Modulus = $2.1 \times 10^5 N/mm^2$ and poisson's ratio = 0.25

8. Compare the values of maximum and minimum hoop stresses for a cast steel cylindrical shell of 600mm external diameter and 400mm internal diameter subjected to a pressure of 30N/mm^2 applied internally and Externally.

Code 9A01301 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
MECHANICS OF SOLIDS
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Define the terms :
   i. Normal stress
   ii. Tangential stress
   iii. Ductility
   iv. Brittleness
   (b) A flat steel plate is of trapezoidal form of uniform thickness 't'. Its width at one end is 'a' and at the other end is 'b'.If its length is 'L', determine its elongation under an axial pull.
2. (a) What are the different types of beams? Describe the behavior of each of them.
   (b) Draw the S.F and B.M diagrams for a cantilever with a point load at the free end and u.d.L through out.
3. (a) State the assumptions involved in the theory of simple bending.
   (b) Derive the bending equation from the first principle.
4. Obtain the shear stress distribution for a rectangular cross section 230X40mm subjected to a shear force of 40KN. Calculate the maximum and average shear stress.
5. (a) A beam of length L is supported at each end with a couple applied at an intermediate point. Deduce an expression for the deflection and hence calculate the deflection at the point of application of the moment.
   (b) A beam of length L carriers a uniformly distributed load w unit length and rests on three supports, two at the ends and one in the middle. Find how much the middle support be lower than the end ones in order that the pressure on the three supports shall be equal.
6. (a) Derive an expression for the deflection in a closely coiled helical spring due to axial load w. Use standard notations.
   (b) Write the assumptions made in torsional equation.
7. A shell 3.25m long, 1m in diameter is subjected to an internal pressure of 1 N/mm^2. If the thickness of the shell is 10mm, find the circumferential and longitudinal stresses. Also find out the maximum shear stress and the changes in the dimensions of the shell. Take $E = 2.1 \times 10^5 N/mm^2, \mu = 0.3$
8. A steel cylinder of outside diameter 240mm and inside diameter 200mm is shrunk on to one having diameter 200mm and 160mm, the interference fit being such that under an internal pressure p, the inner tensile stress in both cylinders is 85.4N/mm^2 . Find the initial difference in the nominal 200mm diameters and value of p if $E = 2.1 \times 10^5 N/mm^2$.

Code 9A01301

4

II B.Tech I semester (R09) Regular Examinations, November 2010
MECHANICS OF SOLIDS
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Distinguish between stress and strain, normal stress and shear stress, working stress and yield stress.
   (b) A 10mm diameter rod was subjected to axial full of 10KN and the change in diameter was observed to be 0.003mm. Calculate poisson's ratio and modulus of elasticity. Find also bulk modulus. Assume rigidity modulus as $5 \times 10^4 N/mm^2$.

2. (a) Define statically determinate and statically indeterminate beams. Give examples.
   (b) Draw the shear force and B.M diagram for a simply supported beam of length 8m and carrying a uniformly distributed load of 12KN/m for a distance of 4m from the left end. Also calculate the maximum B.M on the section.

3. (a) State the assumptions involved in the theory of simple bending.
   (b) Derive the bending equation from first principle.

4. (a) Prove that for a rectangular section the maximum shear stress is 1.5times the average stress. Sketch the variation of shear stress.
   (b) A timber beam 120m wide and 185mm deep supports a u.d.l of intensity wKN/m length over a span of 2.7m. If the safe stresses are 29Mpa in bending and 3Mpa in shear, calculate the safe intensity of the load which can be supported by the beam.

5. (a) Derive an expression for the deflection of a simply supported beam subjected to uniformly distributed load using integration method.
   (b) A rectangular R.C simply supported beam of length 2m and cross section 100mmX200mm is carrying an uniformly distributed load of 10KN/m through its span. Find the maximum slope and deflection. Take $F = 2 \times 10^4 N/mm^2$.

6. Derive the basic torsion equation
   $\frac{q}{r} = \frac{f_s}{R} = \frac{T}{J} = \frac{N\theta}{L}$
   and write the assumptions.

7. A spherical shell of 90mm internal diameter has to with stand an internal pressure of 35N/mm^2 . Find the thickness of the shell required. The max. permissible tensile stress is 80N/mm^2 .

8. (a) Find the ratio of thickness to internal diameter of a tube subjected to internal pressure when the pressure is 3/8 of the max. permissible hoop stress.
   (b) Find the increase in internal diameter of such a tube 100mm in internal diameter subjected to an internal pressure of $90N/mm^2$. Neglect longitudinal strain and take $E = 200GN/m^2$ and $y_m = 0.3$.

Code :9A02301

1

II B.Tech I Semester (R09) Regular Examinations, November 2010
ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

(Choose minimum of TWO questions from each part for answering FIVE questions)

PART-A

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1. (a) Define and explain Kirchoff's laws.

   (b) Determine the current through 2Ω resistor and the voltage drop across 3Ω resistor.

2. (a) Explain the applications of DC machines.
   (b) A long shunt compound generator delivers a load current of 50A at 500V and has armature, series field and shunt field resistance of 0.05Ω, 0.03Ω and 250Ω. Calculate the generated emf and armature current. Allow 1.0v for branch for contact drop.

3. (a) Explain the principle of operation of single phase transformer.
   (b) A single phase transformer has 350 primary and 1050 secondary turns. The net cross-sectional area of the core is 55cm^2. If the primary winding be connected to a 400V, 50 Hz single phase supply, calculate the maximum value of flux density in the core.

4. (a) Define slip. Explain the slip-torque characteristics of induction motors.
   (b) A 400V, 10KVA, 3 phase alternator with star connected stator winding has an effective armature resistance per phase of 1.0 Ω. The alternator generates an open circuit voltage per phase of 90V with a field current of 1.0A. During the short circuit test, with 1.0A of field current the short circuit current flowing in the armature is 15A. Calculate
      i. The synchronous impedance
      ii. Synchronous reactance.

PART-B

5. (a) What is a PN junction mode ? Explain the V-I characteristics and how do you determine DC and AC resistance from it.
   (b) An AC voltage of peak value 20V is connected in series with a silicon and diode load resistance of 500 ohms. If the forward resistance of diode is 10Ω find
      i. peak current through diode
      ii. Peak output voltage. What will be these values if the diode is assumed to be ideal?

6. (a) What is a thyristor ? Explain its characteristics and applications.
   (b) What is an oscillator ? How an oscillator is obtained using transistor and what are the necessary conditions?

7. (a) Explain about dielectric heating and its applications.
   (b) How are ultrasonics generated and what are their applications?

8. (a) What are the three basic components of CRO and their uses ?
   (b) How do you measure the current with a CRO?

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Code :9A02304

2

II B.Tech I Semester (R09) Regular Examinations, November 2010
ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

(Choose minimum of TWO questions from each part for answering FIVE questions)

PART-A

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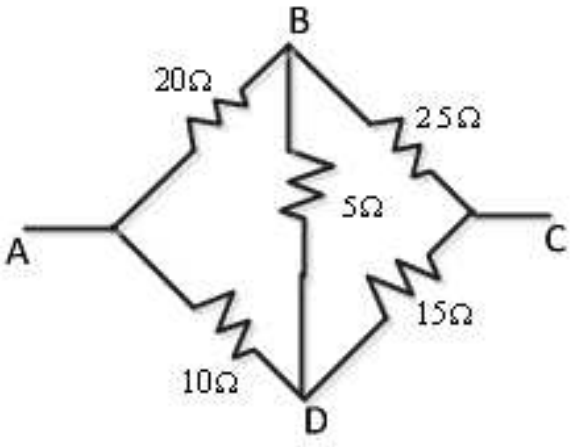
1. (a) Explain in detail about active elements.



   (b) Find the resistances between A and C terminals by using star. Delta Transformation.

2. (a) Derive the emf equation of DC generator.
   (b) The armature of DC machine has a resistance of 0.15Ω and is connected to a 200V supply. If the armature current observed when it is acting as a motor is 40A. Calculate the back emf generated by armature.

3. (a) Explain the different losses that occur in a single phase transformer.
   (b) A single phase transformer has 350 primary and 1050 secondary turns. The net cross sectional area of the core is 60 cm^2. If this primary winding is connected to a 400V, 50Hz single phase supply, calculate the voltage induced in this secondary winding.

4. (a) Explain the principle of operation of alternators.
   (b) A 12-pole, 3-phase alternator is coupled to an engine running at 500rpm. The generator supplies an induction motor having a full load speed of 1440rpm. Find the percentage slip and number of poles of this induction motor.

PART-B

5. (a) Describe a half wave rectifier using a crystal diode.
   (b) An AC supply of 230V is applied to a half wave rectifier circuit through a transformer of turn ratio 10:1, find the
      i. Output dc stage
      ii. Peak inverse voltage. Assume the diode to be ideal.

6. (a) Distinguish between PNP and NPN transistors in their operation.
   (b) What is an amplifier and how a transistor is used as an amplifier?

7. Distinguish between dielectric heating and induction heating. Explain with their applications.

8. (a) What are the main components of CRT? Explain them.
   (b) Explain the measurement of frequency using CRO.

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Code :9A02304

3

II B.Tech I Semester (R09) Regular Examinations, November 2010
ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

(Choose minimum of TWO questions from each part for answering FIVE questions)

PART-A

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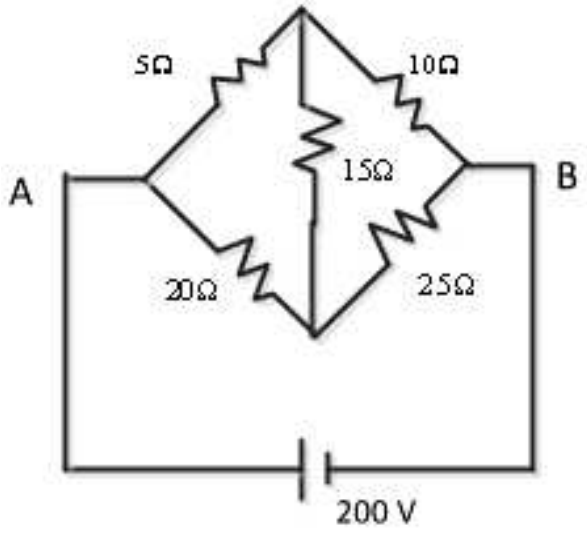
1. (a) Define and explain Ohm's law.



   (b) Determine the current delivered by the source by using Star-Delta transformation.

2. (a) What is the purpose of using 3-point starter in a DC machine. Explain the working with a neat diagram.
   (b) A 6 pole lap wound DC generator has 960 conductors and a flux of 40 m Wb and is driven at 400 rpm. Find induced emf.

3. (a) Derive efficiency and regulation.
   (b) A 100 KVA, 1000/10000 V, 50Hz single phase transformer has an iron loss of 1100W. The copper loss with 5A in this high voltage winding is 400W. Calculate the efficiencies at i) 25% ii) 50% of normal load for power factor of a) 1.0 and b)0.8. The output terminal voltage being maintained at 10,000V.

4. Define regulation of alternator. Explain the procedure to determine regulation by synchronous impedance method with neat circuit diagram.

PART-B

5. (a) With a neat sketch explain the operation of a fullwave rectifier.
   (b) A full wave rectifier uses two diodes, the internal resistances of each dode may be assumed constant at 20 ohms. The transformer rms secondary voltage from centre tap to each end of secondary is 50V and load resistance is 980 ohms. Find
      i. mean load current
      ii. the rms value of low current.

6. (a) Explain the transistor as an amplifier in CE arrangement and its frequency response.
   (b) Discuss about SCR characteristics and its applications.

7. (a) What is induction heating ? Explain with an application.
   (b) How flow detection is made using ultrasonics?

8. (a) Explain how CRO can be used for measurement of voltage.
   (b) Explain the functions of deflection plates in CRT.

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Code :9A02304

4

II B.Tech I Semester (R09) Regular Examinations, November 2010
ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

(Choose minimum of TWO questions from each part for answering FIVE questions)

PART-A

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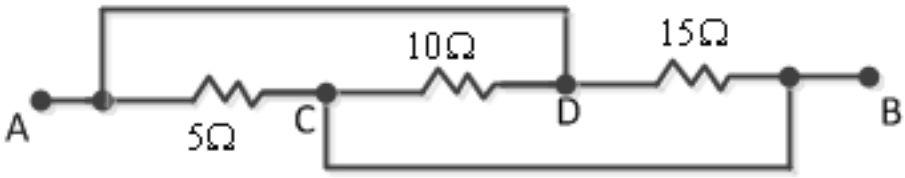
1. (a) Explain in detail about passive elements.



   (b) Find the equivalent resistance between A and B terminals.

2. (a) Explain the principle of operation of DC generator.
   (b) A 250 V DC shunt motor takes 41A at full load. Resistance of motor armature and shunt field windings are 0.1Ω and 250Ω. Find the back emf on full load.

3. (a) Derive the emf equation of single phase transformer.
   (b) A single phase transformer working at unity power factor has an efficiency of 90% at both half load and at full load of 500W. Determine the efficiency at 75% of full load.

4. Explain the principles of operation of induction motor with neat diagram.

PART-B

5. (a) What is a crystal diode? Explain its rectifying action. Discuss the importance of inverse voltage in rectifier .
   (b) With a neat sketch explain the working of centre tap full wave rectifier.

6. (a) Discuss the types of transistor and its action in detail.
   (b) Describe the operation of transistor as an amplifier.

7. (a) What is dielectric heating? Explain with an application.
   (b) What are ultrasonics ? How are they generated and what are their applications?

8. Draw the functional block diagram of a CRO and explain the function of each blocks. What are its applications?

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Code 9A03301 1

II B.Tech I semester (R09) Regular Examinations, November 2010
MATERIALS SCIENCE & ENGINEERING
(Common to Aeronautical Engineering & Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. Discuss the effect of grain boundaries on the properties of alloys and metals.
2. What are electron compounds? Explain with examples.
3. Distinguish between :
   (a) Eutectic systems and peritectic systems.
   (b) Crystallization and allotropy.
4. (a) What are alloy cast irons?
   (b) Grey cast - iron is brittle, inspite of having soft phase ie, ferrite and graphite in its micro - structure. Explain the reason.
5. What do you know about the cryogenic treatment of alloys? Discuss some applications.
6. Discuss about the structure and properties of titanium alloys.
7. What are cermets? Where are they used? Discuss.
8. Discuss various methods used for manufacturing of composite materials.

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Code 9A03301 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATERIALS SCIENCE & ENGINEERING
(Common to Aeronautical Engineering & Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. Explain various methods used for grain size estimation.
2. Explain Hume Rothery rules.
3. Distinguish between :
   (a) Eutectoid and peritectoid reactions
   (b) Coring and allotropy
4. Explain and classify steels.
5. Discuss the effect of alloying elements on T - T - T diagram and on eutectoid composition and temperature.
6. Discuss the structure and properties of some important copper alloys.
7. What are crystalline ceramics? Discuss their applications.
8. Explain some particle - reinforced composites with their applications.

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Code 9A03301 **3**

II B.Tech I semester (R09) Regular Examinations, November 2010
MATERIALS SCIENCE & ENGINEERING
(Common to Aeronautical Engineering & Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. Explain various types of bonds in solids giving examples.
2. Explain various types of solids solutions with examples.
3. Distinguish between :
   (a) Diffusion and coring.
   (b) Natural - aging alloys and congruent - melting alloys.
4. Explain and classify cast - irons.
5. Discuss the effect of alloying elements on iron - iron carbon systems.
6. Discuss about the application of titanium and its alloys in an industry of your choice.
7. What are ceramics? How are they different from metal ceramic mixtures?
8. (a) Explain various techniques used for fabrication of composite materials.
   (b) Explain the process of pultrusion

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Code 9A03301 4

II B.Tech I semester (R09) Regular Examinations, November 2010
MATERIALS SCIENCE & ENGINEERING
(Common to Aeronautical Engineering & Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. What do you understand by metallic bond? Explain its formation with examples.
2. What do you mean by intermediate alloy phase? Explain with examples.
3. Distinguish between :
   (a) Lever rule and Raoult's Law.
   (b) Congruent - melting alloys and allotropy.
4. (a) What are low alloy steels?
   (b) What are the properties of tool and die steels?
5. What do you mean by surface hardening? Explain some methods in detail.
6. Discuss the structure and properties of aluminium alloys.
7. What are glasses? What do you understand by the glass transition temperature?
8. Explain the structure and properties of metal ceramic mixtures.

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Code 9A03302 **1**

II B.Tech I semester (R09) Regular Examinations, November 2010
THERMODYNAMICS
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Show that work is path function and not a state function.
   (b) What do you mean by stagnation and static pressure?
   (c) Justify the statement that work and heat are not properties.
2. (a) Explain the working principle of a gas thermometer with a neat sketch.
   (b) Explain the working principle of thermo-electric thermometer.
3. (a) Define Helmholtz and Gibbs Free energy functions and give their physical significance.
   (b) Derive the Clausius Clapeyron equation.
4. Derive the following Tds equations.
   (a) $Tds = c_v dT + \beta T dv/k$
   (b) $Tds = c_p dT - v\beta T dp$
   (c) $Tds = (c_v K/\beta)\, dp + (c_p/\beta.v)\, dv$
5. (a) The specific heats of a gas are given by $c_p = a + KT$ and $c_v = b + KT$, where a,b and k are constant and T in degrees K. Show that for an isentropic expansion of this gas $T^b.V^{(a-b)}.e^{KT} = cons\tan t$
   (b) Distinguish between a perfect and a real gas.
6. Two vessels, A and B, both containing nitrogen are connected by a value which is opened to allow the contents to mix and achieve an equilibrium temperature of 27^0c . Before mixing the following information is known about the gases in the two vessels.

Vessel A	Vessel B
P = 1.5 MPa	P=0.6 MPa
t=50^0c	t=20^0c
Contents = 0.5 kg mole	Content=2.5kg

   Calculate the final equilibrium pressure and the amount of heat transferred to the surroundings. If the vessel has been perfectly insulated, calculate the final temperature and pressure which would have been reached. Take r=1.4.
7. (a) What are the various psychrometric processes? Show them on a psychrometric chart.
   (b) What are the applications of psychrometric and explain them briefly with a neat sketch.
8. Derive an expression for the thermal efficiency and mean effective pressure of an Otto cycle by drawing PV and TS diagrams.

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Code 9A03302 **2**

II B.Tech I semester (R09) Regular Examinations, November 2010
THERMODYNAMICS
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Explain thermodynamics system, surrounding and universal. Distinguish between closed, open, isolated homogenous and heterogeneous systems. Illustrate with examples.
   (b) Explain the terms state, path, process and cyclic process.
2. (a) What are the different scales of temperatures? Establish the mathematical relations among each other.
   (b) Define a new temperature scale, say ^0M. At ice and steam point the temperature are 80^0M and 300^0M respectively. Correlate this with the Centigrade scale. The ^0N reading on this scale is a certain number of degrees on a corresponding absolute temperature scale. Find this absolute temperature at ^0N .
3. (a) What are the limitations of the first law of Thermodynamics ?
   (b) Define Clausius inequality and prove it.
4. Explain the specific volume and temperature diagram of a pure substance with a neat sketch, showing all the phases.
5. (a) Derive the expression for critical properties of Vanderwall's equation.
   (b) What are the limitations of the Vanderwall's equation ?
6. (a) Define mole fraction and mass fraction of a perfect gas.
   (b) Derive the expressions for internal energy, enthalpy, entropy and specific heats of gas mixtures.
7. (a) Explain dry bulb temperature, wet bulb temperature & dew point temperature.
   (b) Explain the adiabatic saturation process in detail.
8. Derive the expression for thermal efficiency and mean effective pressure of a diesel cycle by drawing PV and TS diagrams.

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Code 9A03302

3

II B.Tech I semester (R09) Regular Examinations, November 2010
THERMODYNAMICS
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Discuss the macroscopic and microscopic point of view of thermodynamics.
   (b) Explain the term "Energy". How will you find the presence of energy? What are the different forms of energies? Explain and give some examples. What is total energy?
2. (a) Define and explain "Zeroth Law of Thermodynamics".
   (b) Explain the working principle of radiation and optical pyrometers.
3. (a) Derive the following expressions:
      i. $c_p - c_v = R$
      ii. $(Q_{1-2})_p = mc_p\Delta T$
      iii. $(Q_{1-2})_v = mc_v\Delta T$
4. (a) Discuss the various method of determining the dryness fraction of steam with relative merits and demerits.
   (b) Steam at 18 bar and 0.95 dry is throttled to 14bar and passed to an engine which expands it isentropically to 0.3bar and exhausts at this pressure, Determine.
      i. entropy per kg of steam entering the engine.
      ii. the steam consumption of the engine in kg/KWh.
      iii. The internal energy per kg of steam leaving the boiler. Solve using Mollier chart.
5. (a) 4 Kg of air is compressed in a reversible steady flow polytropic process $\left(pV^{1.25} = c\right)$ from 1 bar and 30^0C to 10 bar. Calculate the work input, heat transferred and the change in the entropy.
6. Derive the various PVT relations for the mixture of ideal gases.
7. (a) Explain the terms which are commonly used in psychrometric.
   (b) A mixture of air and water vapor possesses a volume of $100m^3$ at 1 bar pressure and temperature 35^0c . Its relative humidity is 75%. Find the specific humidity, the dew point, air mass and vapor mass in the mixture.
8. Derive an expression for thermal efficiency & mean effective pressure of a dual combustion cycle by drawing PV and TS diagrams.

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Code 9A03302

4

II B.Tech I semester (R09) Regular Examinations, November 2010
THERMODYNAMICS
(Aeronautical Engineering, Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) What do mean by "property"? Distinguish between intensive and extensive properties.
   (b) A barometer reeds 76cm of Hg. What would be the absolute pressure if
      i. a pressure gauge connected to turbine inlet reads 28 bar and
      ii. a vacuum gauge connected in the exhaust line of the same turbine reads 70cm of Hg?
2. (a) What are the advantages of gases over liquids as a thermometric substances ?
   (b) Two thermometers one Centigrade and other Fahrenheit immersed in a fluid read the same numerical value. Find the temperature of the fluid expressed in ${}^0K$ and ${}^0R$ .Also, find the identical numerical value shown by the thermometer.
3. (a) Derive the expression $c_p - c_v = T\beta^2 v/k$ from the fundamentals.
4. (a) State the Clapeyron equation and its practical utility.
   (b) What do you mean by triple point of a substance? Is triple point same as ice point?
5. Find the second and third virial coefficients of Vanderwaals equation of state when expressed in the form $\left(p + \left(an^2/v^2\right)\right)(V - nb) = nrt$.
6. A perfect gas mixture consists of 3 KG of N_2 and 5 KG of CO_2 at a pressure of 3 bar and a temperature of 20^0c. Calculate
   (a) The mole fraction of each constituent
   (b) The equivalent molecular weight of the mixture.
   (c) The partial pressure and partial volume.
   (d) The volume and the density of the mixture.
7. (a) Distinguish clearly between the terms of dry bulb temperature, dew point temperature, wet bulb temperature and adiabatic saturation temperature as used in psychrometrics.
   (b) What do you mean by-pass factor of a cooling and heating coil?
8. Compare Otto, Diesel and Dual combustion cycles based on
   (a) Same compression ratio and heat rejection
   (b) Based on the same maximum pressure, temperature and heat rejection by drawing PV and TS diagrams.

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