Code: 9A03303

1

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MACHINE DRAWING

(Mechanical Engineering)

Time: 4 hours Max. Marks: 70

*****

Section – I
(Answer any two questions, 2 x 4 = 8 M)

1. Sketch the conventional representation of any four materials.

2. Sketch the method of dimensioning Chamfers and Countersunk.

3. Sketch the conventional representation of screw threads with dimensioning.

Section – II
(Answer any two questions, 2 x 10 = 20 M)

4. Draw the sectional front view and side view of a half-lap muff coupling.
   Take D=30 mm.

5. Draw the sectional front view and top view of a double riveted chain lap joint. Take diameter of rivet = 18 mm.

6. Sketch the following thread profiles:
   (a) Buttress thread.
   (b) Worm thread.

Section – III
(Compulsory question, 1 x 42 = 42 M)

7. Draw the following views of a stuffing box.
   (a) Half sectional front view with right half in section
   (b) Top view.

Contd. in page 2

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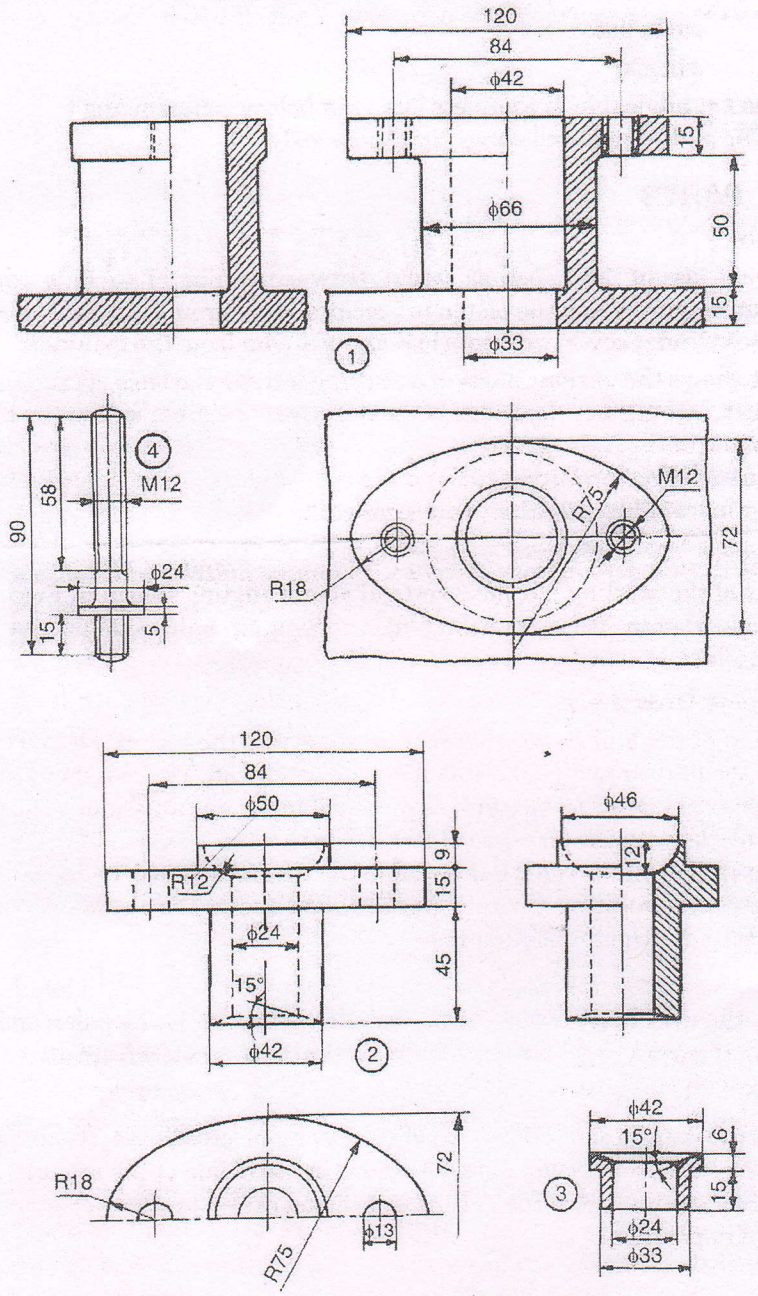


Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Gland	Brass	1
3	Bush	Brass	1
4	Stud	MS	2
5	Nut, M12	MS	2

Stuffing box

Code: 9A03303

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MACHINE DRAWING

(Mechanical Engineering)

Time: 4 hours Max. Marks: 70

*****

Section – I
(Answer any two questions, 2 x 4 = 8 M)

1. Sketch the following type of line:
   (a) Central line.
   (b) Cutting plane line and
   (c) Long break line.

2. Sketch the conventional representation of the following:
   (a) Spur gear.
   (b) Helical gear.

3. Sketch the conventional representation of the following materials
   (a) Zinc.
   (b) Glass.
   (c) Asbestos.
   (d) Cast iron.

Section – II
(Answer any two questions, 2 x 10 = 20 M)

4. Draw the sectional front view and top view of a single riveted single strap Butt joint. Take diameter of rivet = 18 mm.

5. Draw the sectional front view with top half in section, and top view of a Cotter joint with sleeve. Take D=20 mm.

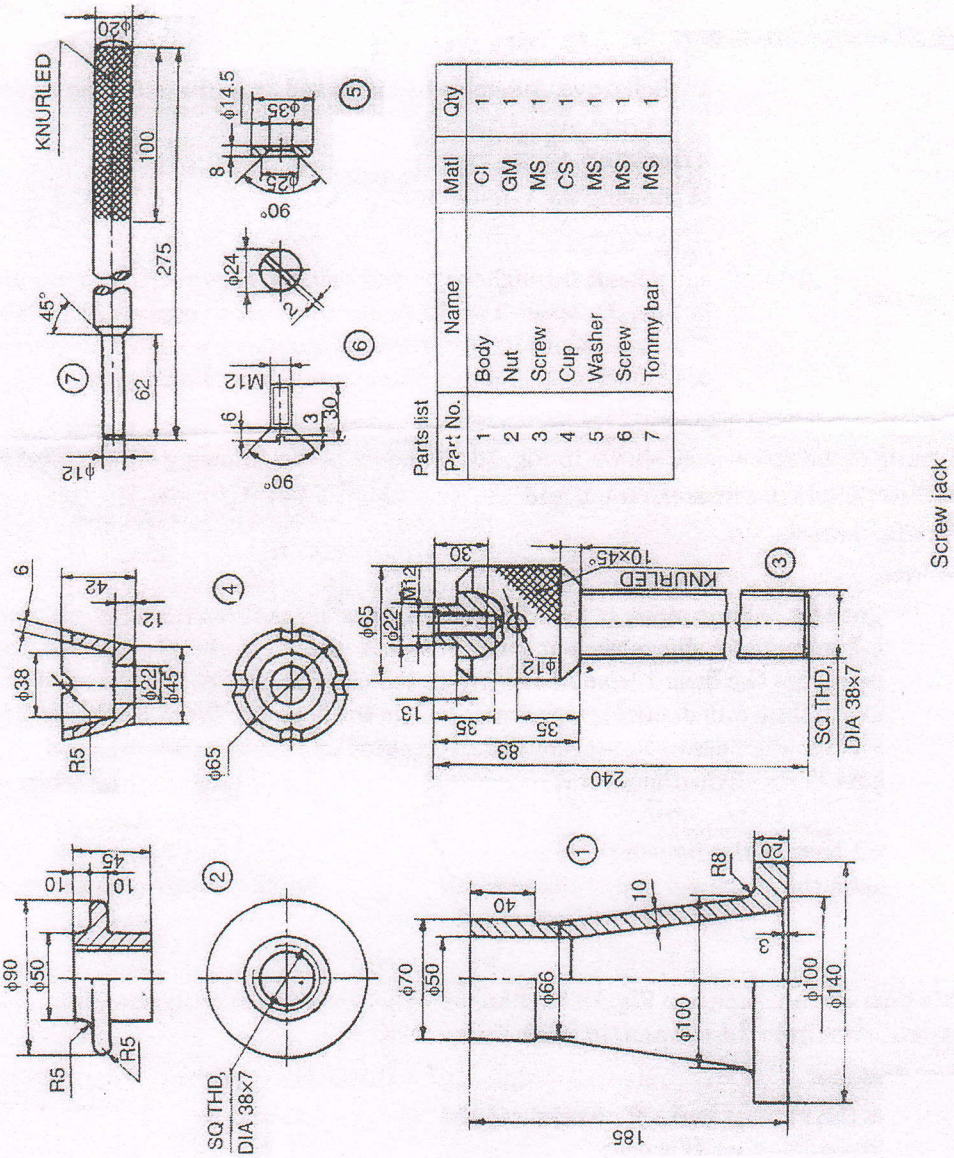
6. Draw the sectional front view and side view of a butt-muff coupling. Take D=30 mm.

Section – III
(Compulsory question, 1 x 42 = 42 M)

7. Draw the following views of a screw jack.
   (a) Half sectional front view with right half in section.
   (b) Top view.

Contd. in page 2

Code: **9A03303**



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Nut	GM	1
3	Screw	MS	1
4	Cup	CS	1
5	Washer	MS	1
6	Screw	MS	1
7	Tommy bar	MS	1

Code: 9A03303

3

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MACHINE DRAWING

(Mechanical Engineering)

Time: 4 hours Max. Marks: 70

*****

Section – I
(Answer any two questions, 2 x 4 = 8 M)

1. Sketch the conventional representation of the following:
   (a) Curved features.
   (b) Tapered features.

2. Sketch the following:
   (a) Parallel dimensioning.
   (b) Chain dimensioning.

3. Sketch the conventional representation of the following:
   (a) Thread in section.
   (b) Assembled threads in section.

Section – II
(Answer any two questions, 2 x 10 = 20 M)

4. Sketch the key with Gib head in two views, as fitted in position between a shaft and the mounting. Choose the shaft diameter as 30 mm and the hub diameter of the mounting as 60 mm.

5. Draw the sectional front view and top view of a single riveted double strap butt join. Take diameter of rivet = 18 mm.

6. Sketch the following thread profiles:
   (a) Whitworth thread.
   (b) Worm thread.

Section – III
(Compulsory question, 1 x 42 = 42 M)

7. Draw the following views of an Eccentric.
   (a) Sectional front view with top half in section.
   (b) Side view.

Contd. in page 2

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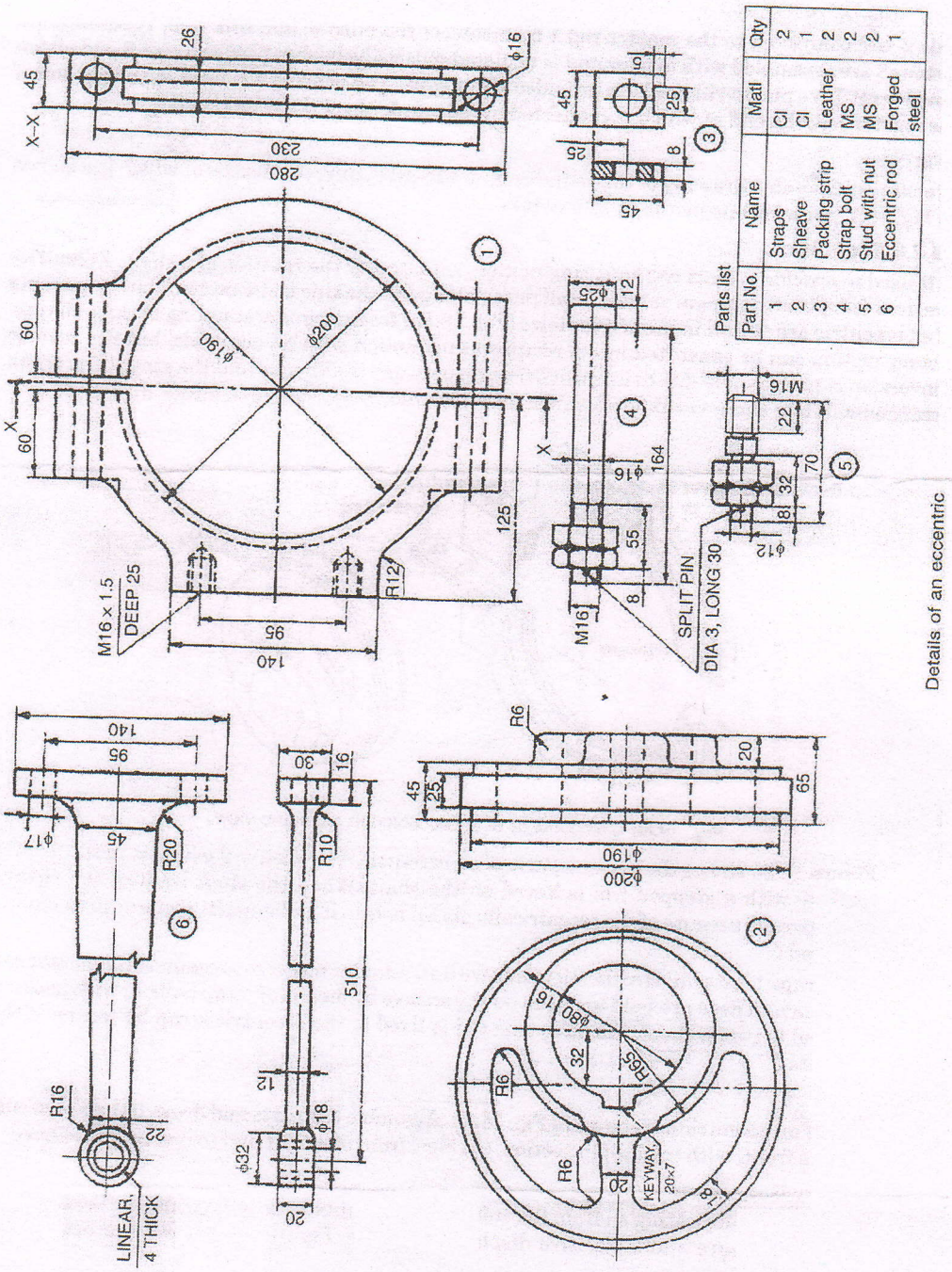

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4

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MACHINE DRAWING

(Mechanical Engineering)

Time: 4 hours Max. Marks: 70

*****

Section – I
(Answer any two questions, 2 x 4 = 8 M)

1. Sketch the conventional representation of the following:
   (a) External threads.
   (b) Internal threads.

2. Sketch the conventional representation of any two types of set screws.

3. Sketch the conventional representation of the following:
   (a) Webs.
   (b) Ribs.

Section – II
(Answer any two questions, 2 x 10 = 20 M)

4. Sketch the key with Gib head in two views, as fitted in position between a shaft and the mounting. Choose the shaft diameter as 30 mm and the hub diameter of the mounting as 60 mm.

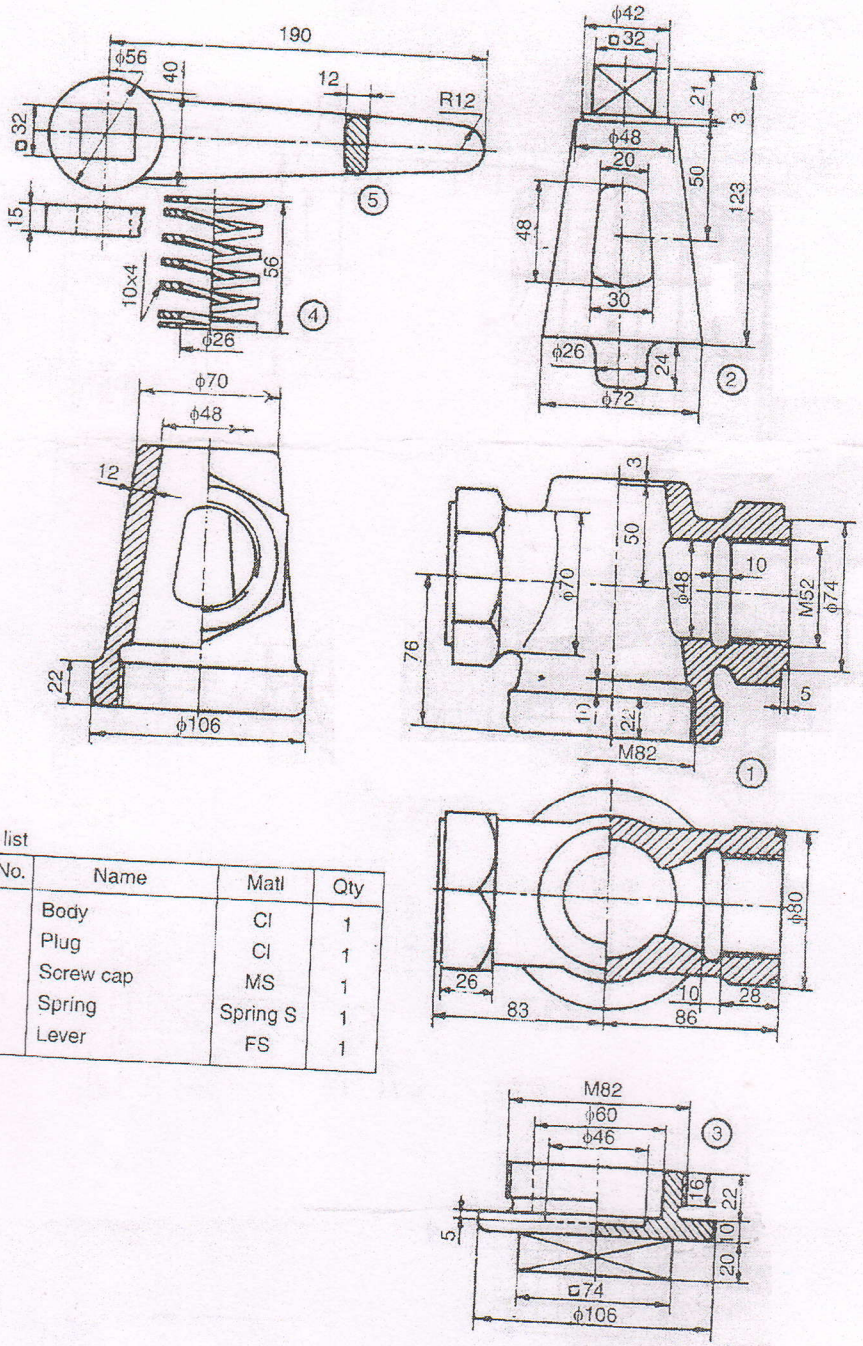
5. Draw the sectional front view and top view of a single riveted double strap butt join. Take diameter of rivet = 18 mm.

6. Sketch the following thread profiles:
   (a) Whitworth thread.
   (b) Worm thread.

Section – III
(Compulsory question, 1 x 42 = 42 M)

7. Draw the following views of a Air Cock.
   (a) Half sectional front view with right half in section.
   (b) Top view.

Contd. in page 2



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Plug	CI	1
3	Screw cap	MS	1
4	Spring	Spring S	1
5	Lever	FS	1

Air cock

Code: 9ABS301

1

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

MATHEMATICS - II

(Common to AE, BT, CE and ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Determine the rank of the matrix $\begin{bmatrix} 4 & 2 & 3 \\ 8 & 4 & 6 \\ -2 & -1 & -3/2 \end{bmatrix}$ by reducing it to echelon form.

(b) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$

2 (a) Show that B = $\begin{bmatrix} 3i & 2+i \\ -2+i & -i \end{bmatrix}$ is skew – Hermitian. Find its eigen values.

(b) (i) If A ix a Hermitian, then prove that iA is skew-Hermitian.

(ii) If A is a Skew-Hermitian, they prove that iA is Hermitian.

3 (a) Find the Fourier expansion of $f(x) = \pi x \; in \; (-c, c)$

(b) Obtain half-range sine series for $f(x) = e^x \; in (0,1)$

4 (a) Find the Fourier transform of $e^{-|x|}$

(b) Find finite Fourier sine and cosine transform $f(x) = x^2$, $0 < x < 4$

5 (a) Form the partial differential equation by eliminating the arbitrary function from $z = y\, f(x^2 + z^2)$.

(b) Solve by method of separation of variables $u_x = 2u_t + u$ where $u(x, 0) = 6e^{-3x}$

Contd. in Page 2

6 (a) Find an approximate value of the real root of $x^3 - x - 1 = 0$ by bisection method.

(b) Find a root of $e^x \sin x = 1$ using Newton-Raphson Method.

7 (a) Derive the normal equations to fit a straight line $y = a + bx$.

(b) Evaluate $\int_{0.6}^{2.0} y\,dx$ using Trapezoidal rule.

8 Solve $\frac{dy}{dx} = y + x^2$, $y(0) = 2$ for y at x = 0.4 by obtaining initial solutions from Runge Kutta method.

*****

Code: 9ABS301

2

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

MATHEMATICS - II

(Common to AE, BT, CE and ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Find the sum and product of the eigen values of A = $\begin{bmatrix} 2 & 1 & -1 \\ 3 & 4 & 2 \\ 1 & 0 & 2 \end{bmatrix}$

(b) Find the eigen values and eigen vectors of A = $\begin{bmatrix} 2 & 1 \\ 4 & 5 \end{bmatrix}$

2 (a) Define the following:
(i) Hermitian matrix. (ii) Skew-Hermitian matrix.
(iii) Unitary matrix. (iv) Orthogonal matrix

(b) Find the eigen vectors of the skew – Hermitian matrix A = $\begin{bmatrix} 2i & 3i \\ 3i & 0 \end{bmatrix}$

3 (a) Expand $f(x)=|\cos x|$ as a Fourier series in $(-\pi,\pi)$

(b) Find the Fourier expansion of the function $f(x)=x-x^2$ *in* $(-1,1)$

4 (a) State and prove Linear property and change of scale property of Fourier transform.

(b) Find $f(x)$ *if* $F_c\{f(x)\}=e^{-as}$

5 Find the steady state temperature in a rectangular plate $0 < x < a$, $0 < y < b$, when the sides $x = 0$, $x = a$, $y = b$ are insulated while the edge $y = 0$ is kept at temperature k$\frac{cos\pi x}{a}$.

Contd. in Page 2

6 Express the function $\frac{x^2+6x-1}{(x^2-1)(x-4)(x-6)}$ as a sum of partial fractions, using Lagrange's formula.

7 (a) Fit an exponential curve of the form $y(x) = a\,e^{bx}$ to the following data.

X	1	2	3	4	5
Y	2.6	3.3	4.2	5.4	6.9

(b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 1.1 from the following data

x	1	1.2	1.4	1.6	1.8	2
y	2.72	3.32	4.06	4.95	6.05	7.39

8 Apply Milne Predictor Corrector method to find y(0.8), y(1.0) from the equation $y' = y - x^2$, y(0) = 1 by obtaining the starting values by Euler method.

*****

Code: 9ABS301

3

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

MATHEMATICS - II

(Common to AE, BT, CE and ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Show that the equations x + y + z = 4; 2x + 5y – 2z = 3; x + 7y - 7z = 5 are not consistent.

(b) Solve the equations: x +y + z = 9; 2x + 5y + 7z = 52 and 2x + y - z = 8.

2 (a) Find the rank and signature of the quadratic form $x_1 x_2 - 4x_1 x_4 - 2x_2 x_3 + 12x_3x_4$.

(b) Find the nature of the quadratic form $2x_1^2+3x_2^2+4x_3^2+2x_1x_2$.

3 (a) Find half – range cosine series for $f(x)=x \ in \ (0,\pi)$

(b) Find half – range sine series for $f(x)=x \ \ in \ (0,\pi)$

4 (a) Find the Fourier sine transform of $f(x)=\begin{cases}1 & if \ \ 0\le x<1\\ 0 & if \ \ \ \ x>1\end{cases}$

(b) Find the Fourier sine and cosine transform of $f(x)=2e^{-3x}+3e^{-2x}$

5 (a) Form the partial differential equation by eliminating the arbitrary function from $z = y\, f(x^2 + z^2)$.

(b) Solve by method of separation of variables $u_x = 2u_t + u$ where $u(x, 0) = 6e^{-3x}$

6 (a) Find an approximate value of the real root of $x^3 – x – 1 = 0$ by bisection method.

(b) Find a root of $e^x \sin x = 1$ using Newton-Raphson Method.

7 (a) Derive the normal equations to fit a straight line $y = a + bx$.

(b) Evaluate $\int_{0.6}^{2.0} y\,dx$ using Trapezoidal rule.

8 Solve $\frac{dy}{dx} = y + x^2$, y (0) = 2 for y at x = 0.4 by obtaining initial solutions from Runge Kutta method.

*****

Code: 9ABS301

4

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

MATHEMATICS - II

(Common to AE, BT, CE and ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Show that the matrix A = $\begin{bmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{bmatrix}$ satisfies Cayley – Hamilton theorem.

(b) State Cayley – Hamilton theorem and use it to find the inverse of the matrix A = $\begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$

2 (a) Find the skew-Hermitian form for A = $\begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$ with X= $\begin{bmatrix} 1 \\ i \end{bmatrix}$

(b) Find the Hermitian form of A = with X= $\begin{bmatrix} 3 & 2-i \\ 2+i & 4 \end{bmatrix}$ $\begin{bmatrix} 1+i \\ 2i \end{bmatrix}$

3 (a) Find the Fourier series expansion of $f(x)=x-x^3 \quad in \quad -1<x<1$

(b) Show that when $0<x<\pi,\ \pi-x=\frac{\pi}{2}+\frac{\sin 2x}{1}+\frac{\sin 4x}{2}+\frac{\sin 6x}{3}+----$

4 (a) Find the finite Fourier sine transform of $f(x)=2x,\ 0<x<4$

(b) Find f(x) if its finite sine transform is given by

$F_s(s)=\frac{1+\cos s\pi}{s\pi},\ \ where\ 0<x<\pi,\ S=1,2,3....$

Contd. in Page 2

5 Find the steady state temperature in a rectangular plate $0 < x < a$, $0 < y < b$, when the sides $x = 0$, $x = a$, $y = b$ are insulated while the edge $y = 0$ is kept at temperature $k\frac{\cos \pi x}{a}$.

6 Express the function $\frac{x^2 + 6x - 1}{(x^2 - 1)(x - 4)(x - 6)}$ as a sum of partial fractions, using Lagrange's formula.

7 (a) Fit an exponential curve of the form $y(x) = a\, e^{bx}$ to the following data.

x	1	2	3	4	5
y	2.6	3.3	4.2	5.4	6.9

(b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.1$ from the following data

x	1	1.2	1.4	1.6	1.8	2
y	2.72	3.32	4.06	4.95	6.05	7.39

8 Apply Milne Predictor Corrector method to find y(0.8), y(1.0) from the equation $y' = y - x^2$, y(0) = 1 by obtaining the starting values by Euler method.

*****

Code: 9A01301

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MECHANICS OF SOLIDS

(Common to Aeronautical Engineering, Mechanical Engineering & Mechatronics)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1. A steel rod 5 m long and 30 mm in diameter is subjected to an axial tensile load of 50 kN. Determine the change in length, diameter and volume of the rod. Take E=2x10^5 N/mm^2 and Poisson's ratio=0.25.

2. A cantilever of length 2 m carries a u.d.l of 1 kN/m run over a length of 1.5 m from the free end. Draw the shear force and bending moment diagrams for the cantilever.

3. A beam is simply supported and carries a u.d.l of 30 kN/m run over the whole span. The section of the beam is rectangular having depth as 500 mm. If the maximum stress in the material of the beam is 120 N/mm^2 and moment of inertia of the section is 7x10^8 mm^4 , find the span of the beam.

4. The shear force acting on a beam at a section is F. The section of the beam is triangular base b and of an altitude h. The beam is placed with its base horizontal. Find the maximum shear stress and shear stress at the neutral axis.

5. Explain the laminated springs and Helical springs in detail with the help of neat sketches.

6. Derive the relation between slope, deflection and radius of curvature.

7. A boiler shell is to be made of 15 mm thick plate having a limiting tensile stress of 120 N/mm^2. If the efficiencies of the longitudinal and circumferential join to are 70% and 30% respectively determine: (i) The maximum permissible diameter of the shell for an internal pressure of 2 N/mm^2 and (ii) permissible intensity of internal pressure when the shell diameter is 1.5 m?

8. Determine the maximum and minimum hoop stress actors the section of a pipe of 400 mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8 N/mm^2. Also sketch the radial pressure distribution and hoop stress distribution across the section.

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Code: 9A01301

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MECHANICS OF SOLIDS

(Common to Aeronautical Engineering, Mechanical Engineering & Mechatronics)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

1. (a) Explain the types of stresses and strains.
   (b) Derive the relation between E,G and K.

2. Explain the types of beams and loads in detail with the help of diagrams.

3. A square beam 20 mm x 20 mm in section and 2 m long is supported at the ends. The beam fails when a point load of 400 N is applied at the centre of the beam. What uniformly distributed load per metre length will break a cantilever of the same material 40 mm wide, 60 mm deep and 3 m long?

4. A simply supported wooden beam of span 2 m having a cross-section 150 mm wide by 250 mm deep carries a point load W at the centre. The permissible stress are 10 N/mm^2 is bending and 2 N/mm^2 in shearing. Calculate the safe load W.

5. The stiffness of a close-coiled helical spring is 1.5 N/mm of compression under a maximum load of 60 N. The maximum shearing stress produced in the wire of the spring is 125 N/mm^2. The solid length of the spring (when the coils are touching) is given as 5 cm. Find (i) diameter of wire (ii) mean diameter of the coils and (iii) number of coils required. Take C= 4.5 $x10^4$ N/mm^2.

6. A beam of length 5 m and of uniform rectangular section is supported at its ends and carries u.d.l. Over the entire length. Calculate the depth of the section if the maximum permissible bending stress is 8 N/mm^2 and central deflection is not to exceed 10 mm. Take E=1.2$x10^4$ N/mm^2.

7. A cylinder vessel is 1.5 m diameter and 4 m long is closed at ends by rigid plates. It is subjected to an internal pressure of 3 N/mm^2. If the maximum principal stress in not to exceed 150 N/mm^2, find the thickness of the shell. Assure E=2$x10^5$ N/mm^2 and Poisson's ratio = 0.25. Find the changes in diameter, length and volume of the shell.

8. Derive the stresses in compound thick cylinders.

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Code: 9A01301

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MECHANICS OF SOLIDS

(Common to Aeronautical Engineering, Mechanical Engineering & Mechatronics)

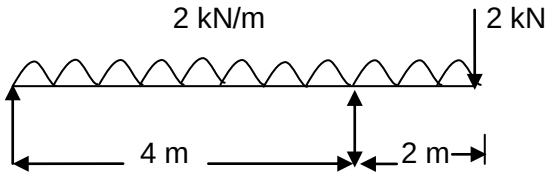
Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

*****

1. (a) The ultimate stress, for a hollow steel column which carries an axial load of 2 MN is 480 N/mm^2. If the external diameter of the column is 200 mm determine the internal diameter. Take the factor of safety as 4.
   (b) Explain the stress – strain diagram for mild steel.

2. Draw the S.F and B.M diagrams for the over-hanging beam carrying u.d.l of 2 kN/m over the entire length and a point of 2 kN as shown in figure. Locate the point of contra-flexure.

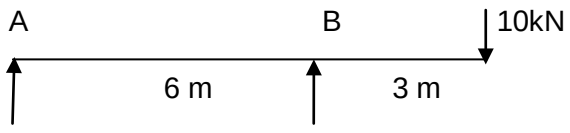


3. State the assumption in theory of simple bending. And derive the equation $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$

4. A timber beam of rectangular section is simply supported at the ends and carries a point load at the centre of the beam. The maximum bending stress is 12 N/mm^2, and maximum shearing stress is 1 N/mm^2, find the ratio of the span to the depth.

5. State the assumptions made in the desiration of shear stress produced in a circular shaft subjected to torsion and derive maximum torque transmitted by a circular solid shaft.

6. An overhanging beam ABC is loaded as shown in figure. Find the slopes over each support and at the right end. Find also the maximum upward deflection between the supports and the deflection at the right end. Take E=2x10^5 N/mm^2 AI=5x10^8 mm^4



7. Derive the formulae for longitudinal and circumferential stresses.

8. Write short notes on:
   (a) Springs.
   (b) Compound cylinders.

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Code: 9A01301

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

MECHANICS OF SOLIDS

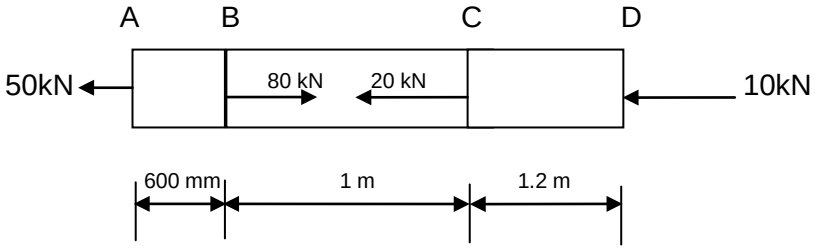
(Common to Aeronautical Engineering, Mechanical Engineering & Mechatronics)

Time: 3 hours Max. Marks: 70

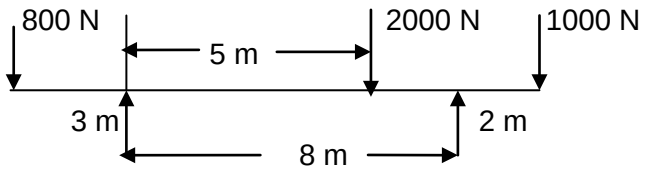
Answer any FIVE questions
All questions carry equal marks

*****

1. A brass bar, having cross-sectional area of 1000 mm^2 is subjected to axial forces as shown in figure. Find the total elongation of the bar. Take E=1.05 x 10^5 N/mm^2.



2. Draw the S.F. and B. M diagrams for the beam which is loaded as shown in figure. Determine the points of contra flexure within the span AB.



3. Derive the section modules for
   (a) Rectangular section (b) Hollow rectangular section (c) circular section (d) Hollow circular section.

4. A beam of square section is used as a beam with one diagonal horizontal. The beam is subjected to a shear force F, at a section. Find the maximum shear in the cross-section of the beam and draw the shear distribution diagram for the section.

5. Derive the shear stress produced in a circular shaft subjected to Torsion.

6. A beam of length 6 m is simply supported at its ends and carries two point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support. Find (i) deflection under each load (ii) maximum deflection and (iii) the point at which maximum deflection occurs. Given E=2x10^5 N/mm^2 deflection occurs. Given E=2x10^5 N/mm^2 and I=85x10^6 mm^4. Use Macaulay's method.

7. A cylinder shell 90 cm long 20 cm internal diameter having thickness of metal as 8 mm is filled with fluid at atmospheric pressure. If an additional 20 cm^3 of fluid is pumped into the cylinder, find (i) the pressure exerted by the fluid on the cylinder and (ii) the hoop stress induced. TakeE=2x10^5 N/mm^2 and $\frac{1}{m} = 0.3$.

8. Derive the Lame's equation for a thick cylindrical shell.

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Code: 9A02301

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING

(Common to Aeronautical Engineering and Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Minimum of two questions from each part should be chosen for answering FIVE questions.
All questions carry equal marks.
Use separate booklets for Part A and Part B.

*****

PART-A

1. (a) Briefly explain the types of elements.
   (b) Three resistors of 5 Ω, 10 Ω, and 15 Ω are joined in parallel. If the current is 10 Ω, resistor is 3 A. What is the current in other resistors and total current?

2. (a) Derive the Torque equation of DC motor.
   (b) Explain the applications of DC Generators.

3. (a) Explain the principle of operation of single phase transformers.
   (b) A single phase transformer working at unity power factor has an efficiency of 95 percent at both one half load and at full load of 1500 W. Determine the efficiency at 60 percent of full load.

4. Explain the principle of operation of induction motors in detail.

PART –B

5. (a) Plot the volt-ampere curve for a P-N diode and explain the nature of this curve.
   (b) Define transition capacitance and diffusion capacitances.
   (c) Draw the circuit diagram of half wave rectifier and explain its working.

6. (a) What is early effect? What are the effects of base width modulation?
   (b) With the help of necessary graphs and sketches explain about SCR characteristics and its applications.

7. (a) Briefly describe the following applications of induction heating:
      (i) Surface hardening of steel.
      (ii) Brazing.
   (b) Explain different methods of generating ultrasonic waves.

8. (a) Derive the expression for the electrostatic deflection sensitivity of a CRT.
   (b) In a CRT, the length of deflecting plates is 1.6 cm, the spacing of the plates is 0.56 cm and the distance from the centre of plates to the screen is 20 cm. Calculate the deflection sensitivity in cm/volt for final anode voltage of 800 and 1200 volts.

*****

Code: 9A02301

2

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING

(Common to Aeronautical Engineering and Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Minimum of two questions from each part should be chosen for answering FIVE questions.
All questions carry equal marks.
Use separate booklets for Part A and Part B.

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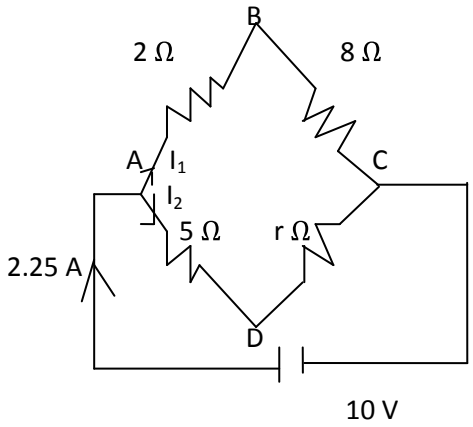
PART-A

1. (a) Write short notes on star-delta transformation.
   (b) For the given circuit calculate the value of current in each branch and the value of unknown resistance 'r' when the total current taken by the circuit in 2.25 A.



2. (a) Explain the significance and operation of 3-point starter used in DC motors.
   (b) Explain the types of DC generators in detail.

3. (a) Explain the losser that occurs in transformers.
   (b) A single phase transformers has 500 primary1500 secondary turns. The net c.s.area of the core is 100 cm^2. If the primary winding be connected to 220 V and 50 Hz supply. Calculate the secondary induced voltage.

4. Explain the slip-torque characteristics and application of induction motors.

PART –B

5. (a) Explain diode current equation.
   (b) Define static resistance and dynamic resistance.
   (c) An A.C. supply of 230 V is applied to a half-wave rectifier circuit through transformer of turns ration 5:1 . Assume the diode is an ideal one. The load resistance is 300 Ω. Find (a) DC output voltage. (b) PIV (c) Maximum m and (d) Average values of power delivered to the load.

6. (a) Sketch the CE output static characteristics of a transistor and indicate the active, cut off and saturation regions. Explain the shape of these characteristics.
   (b) What is the Barkhausen criteria for feedback oscillators? Classify different type of oscillator based on frequency range.

Contd. in page 2

PART –B

7. (a) Explain the principle of induction heating.
   (b) Briefly describe the process of annealing of brass and bronze items with induction heating.

8. (a) Draw the schematic diagram of a CRT and explain about the various sections and the materials used.
   (b) A CRT with final anode voltage of 800 volts is kept with its axis vertical. The distance from the final anode to the screen is 24 cm. Calculate the deflection of spot due to earth's magnetic field. Assume H=0.144 ampere turn/cm.

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Code: 9A02301

3

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING

(Common to Aeronautical Engineering and Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Minimum of two questions from each part should be chosen for answering FIVE questions.
All questions carry equal marks.
Use separate booklets for Part A and Part B.

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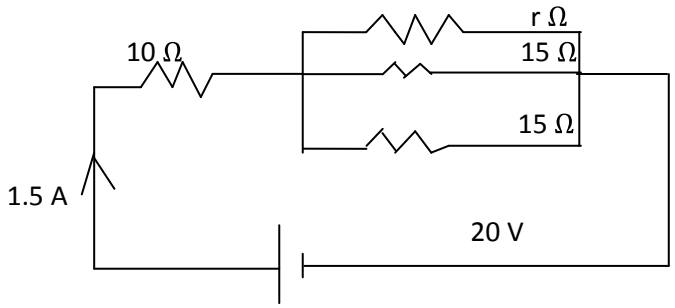
PART-A

1. (a) State and explain ohm's law.
   (b) Calculate the value of resistance 'r' when the total current taken by the network is 1.5 A?



2. (a) Explain the principle of operation of DC generator.
   (b) A 200 V DC shunt motor taken a total current of 100 A and runs at 750 rpm. The resistance of the armature winding and of shunt field winding is 0.1 Ω and 40 Ω respectively. Find the torque developed by armature.

3. (a) Derive the emf equation of single phase transformers.
   (b) Define and derive expression for sufficiency of single phase transformers.

4. Explain the procedure to find out regulation by synchronous impedance method by neat circuit diagram.

PART –B

5. (a) Explain PN diode characteristics in forward bias and reverse bias regions.
   (b) A 230 V , 60 Hz voltage is applied to the primary of 5:1 step down center tapped transformer used in a FWR having a load of 900. If the diode resistance and secondary coil resistance together has a resistance of 100, determine:
      (a) DC voltage across the load.
      (b) DC current flowing through the load.
      (c) DC power delivered to the load.
      (d) PIV across each diode.

6. (a) Explain the operation of a transistor as an amplifier.
   (b) Draw the block diagram of a feedback amplifier and derive the closed loop transfer function.

Contd. in page 2

PART –B

7. (a) Describe the typical methods of coupling of electrodes to the R.F generator for dielectric heating.
   (b) Describe any two applications of ultrasonic waves.

8. (a) List out the advantages and disadvantages of electrostatic and electromagnetic deflection system.
   (b) An electrostatic CRT has a final anode voltage of 600 volts. The deflection plates are 3.5 cm long and 0.8 cm apart, the screen is at a distance of 20 cm from the centre of the plates. A voltage of 20 volts is applied to the deflection plates. Calculate
      (i) Velocity of electron on reaching field.
      (ii) Acceleration due to deflection field.
      (iii) Final velocity attained due to deflection field.
      (iv) Angle of deflection.
      (v) Deflection sensitivity in cm/volt.

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Code: 9A02301

B.TECH II Year I Semester (R09) Regular & Supplementary Examinations November 2012

ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING

(Common to Aeronautical Engineering and Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Minimum of two questions from each part should be chosen for answering FIVE questions.
All questions carry equal marks.
Use separate booklets for Part A and Part B.

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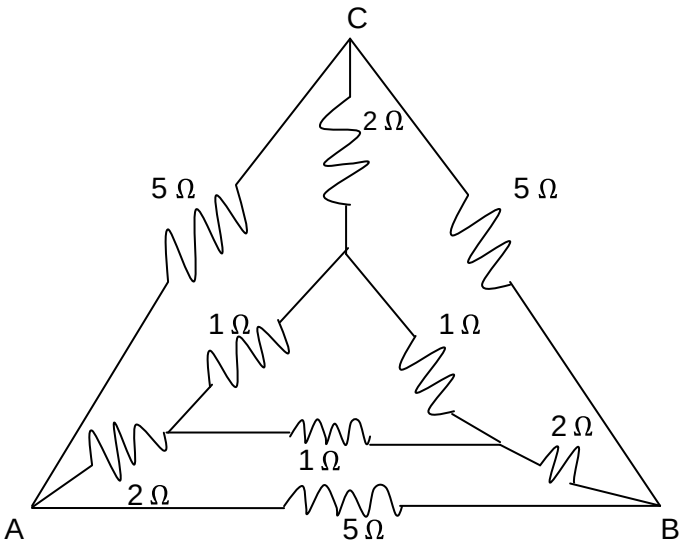
PART-A

1. (a) State and explain Kirchhoff's laws.
   (b) For the given circuit find the resistance between A and B terminals.



2. (a) Derive the emf equation of DC generator.
   (b) A short shunt compound generator supplies 250 A at 220 V. The armature resistance, series field and shunt field are 0.05 Ω 0.04 Ω and 75Ω. Find the emf generated.

3. (a) Derive the and define regulation of transformer.
   (b) The required mo-load voltage ratio is a single phase, 50 Hz, transformer is 5000V/500 V. Find the number of turns in each winding if the flux is to be 0.05 wb.

4. Explain the principle of operation of alternators in detail.

PART –B

5. (a) Draw the energy band diagram of a PN junction diode for no bias, forward bias and reverse bias. Explain.
   (b) Draw the circuit's diagram of bridge rectifier and explain it working. What are the advantages of this rectifier over the full wave rectifier using two diodes?

6. (a) Compare different types of transistor configuration with necessary circuit diagrams using NPN transistor.
   (b) Explain the operation of single stage CE amplifier with a neat circuit diagram. Draw its frequency response.

Contd. in page 2

PART –B

7. (a) Explain the principle of dielectric heating.
   (b) Draw the circuit and briefly describe the working of high frequency power source for induction heating.

8. (a) Explain the use of CRO for the measurement of frequency and phase angle.
   (b) In a parallel place diode, the cathode and anode are spaced 5 mm apart and the anode is kept at 200 V D.C. with respect to cathode. Calculate the velocity and the distance travelled by an electron after a time of 0.5 ns, when
      (i) The initial velocity of an electron is zero and
      (ii) The initial velocity is $2x10^6$ m/s in the direction towards the anode.

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Code: 9A03301

1

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

MATERIALS SCIENCE & ENGINEERING

(Common to AE, ME and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain briefly the BCC and FCC structures.

(b) What are the aggregates and give examples.

2 What is a compound and explain the electron compounds.

3 State and explain the Gibbs phase rule and apply the phase rule for:

(a) Solidification of copper.

(b) Solidification of Cu-Zn alloy.

4 (a) Distinguish between steel and cast iron.

(b) Why is malleable iron made only from hypoeutectic white iron?

5 Explain the limitations on the use of the iron-iron carbide diagram.

6 Differentiate between the terms brass and bronze.

7 Describe the important characteristics of clay and how clay is prepared.

8 Explain fiber reinforced polymer composite (C.F.R.P).

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Code: 9A03301 **2**

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

MATERIALS SCIENCE & ENGINEERING

(Common to AE, ME and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain briefly the metallic bonds in solids.
(b) What is atomic packing factor and find the APF for FCC unit cell.

2 (a) What is a state and give allotropy of any pure metal?
(b) What are the three intermediate alloy phases and give examples?

3 (a) What is eutectic system? Give one example.
(b) Draw and explain the phase diagram for eutectic system.

4 Classify the cast iron and explain the alloy cast iron.

5 Explain T.T.T diagram.

6 Copper is having F.C.C. structure. Discuss the properties of copper based on its crystal structure.

7 What is ceramic? Give the applications & properties of soda lime glass.

8 Explain the advantages & limitations of reinforced composites.

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Code: 9A03301 **3**

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

MATERIALS SCIENCE & ENGINEERING

(Common to AE, ME and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) What are polymorphism and allotropy? Give examples.
(b) Explain the crystallization.

2 State and explain the Hume Rothery's rules.

3 Draw and explain the equilibrium diagram for two metals insoluble in the liquid state and solid state.

4 (a) Which stainless steel is best suited for surgical instruments? Explain.
(b) Give the composition, properties and applications of low carbon alloy steels.

5 State and explain the requirements of hardening.

6 Explain Titanium alloys.

7 Explain clay products. Give some applications of clay products.

8 Explain processing of fiber reinforced composites.

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Code: 9A03301

4

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

MATERIALS SCIENCE & ENGINEERING

(Common to AE, ME and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Define the terms space lattice, unit cell and lattice parameter.

(b) Zinc has HCP structure. The height of the unit cell is 0.494 nm. The nearest neighbor is at a distance of 0.27 nm. Calculate the volume of unit cell of zinc.

2 (a) Explain the unsaturated, saturated and supersaturated solutions.

(b) What is an interstitial solid solution and name some interstitial solute elements?

3 (a) Explain the following: (i) Equilibrium condition. (ii) Constitutional diagram. (iii) Independent variables. (iv) cooling rate.

(b) State and explain the lever rule.

4 (a) Explain the purpose of malleabilization.

(b) Give the composition properties and applications of the 18-4-1 high speed steel.

5 Explain the following:

(a) Annealing.

(b) Normalizing.

(c) Hardening.

6 Explain aluminum silicon phase diagram.

7 What is ceramic? Explain any one of glass forming techniques.

8 Explain the influence of fiber orientation & concentration in re-in forced composites.

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Code: 9A03302

1

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

THERMODYNAMICS

(Common to AE and ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the following terms:
(i) State (ii) Process (iii) Cycle

(b) A fluid at a pressure of 3 bar, and with specific volume of 0.18 m^3/kg, contained in a cylinder behind a piston expands reversibly to a pressure of 0.6 bar according to a law $p = C/v^2$ where C is a constant. Calculate the work done by the fluid on the piston.

2 (a) State the limitations of first law of thermodynamics.

(b) A system undergoes a cycle composed of four processes. The heat transfers n each process are: 400 kJ, -365 kJ, -200 kJ and 250 kJ. The respective work transfers are 140 kJ, 0, -55 kJ and 0. Is the data consistent with first law of thermodynamics?

3 (a) Show the equivalence of Clausius and Kelvin statement of second law.

(b) A heat engine receives heat at the rate of 1500 kJ/min and gives an output of 8.2 KW. Determine (i) the thermal efficiency (ii) the rate of hear rejection.

4 (a) Describe with a neat sketch a separating-throttling calorimeter for measuring the dryness fraction of steam.

(b) Find the specific volume, enthalpy and internal energy of wet steam at 18 bar, dryness fraction 0.8.

5 (a) The specific heat of a gas are given by $C_p = a + KT$, $C_V = b + Kt$ where a,b and k are constants.1.5 kg of this gas occupying a volume of 0.06 m^3 at 5.6 MPa expands isentropically until the temperature is 240^0C. If a = 0.946, b = 0.662, k = 10^{-4}. Calculate work done due to expansion.

(b) 0.30 m^3 of air at a temperature of 45^0C and a pressure of 1000 kN/m^2 is allowed to expand to 1.2 m^3 according to the law $PV^{1.25}$ = constant.
Calculate (i).Work done (ii) Heat transfer.

6 A perfect gas mixture consists of 4 kg of hydrogen and 6 kg of carbon dioxide at a pressure of 4 bar and a temperature of 25^0C. Calculate C_p and C_v of the mixture. If the mixture is heated at constant volume to 50^0C, find the change in the internal energy, enthalpy and entropy of the mixture.

Contd. in Page 2

7 (a) Define the following:
(i) Wet bulb temperature (ii) Dew point temperature
(iii) Absolute humidity (iv) Degree of saturation.

(b) Distinguish between summer air conditioning and winter air-conditioning with the help of sketch.

8 (a) An oil engine working on a dual combustion cycle has a compression ratio 14 and explosion ratio obtained from and indicator card is 1.4. If the cut-off occurs at 6% of the stroke. Find the ideal efficiency.

(b) The efficiency of Otto cycle is 60% and $\gamma = 1.5$. What is compression ratio?

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Code: 9A03302 **2**

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

THERMODYNAMICS

(Common to AE and ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Differentiate between the cyclic process and non-cyclic process.

(b) Prove that heat and work are the path functions.

2 A new temperature scale in ^{0}N is to be defined. The boiling and freezing points on this scale are 400^0 N and 100^0 N respectively.

(a) Correlate this with Centigrade and Fahrenheit scale.

(b) What will be the reading on the new scale corresponding to 60^0C?

3 In order to check the validity of second law of thermodynamics m_1 kg of water at temperature T_1 is isobarically and adiabatically mixed with m_2 kg of water at temperature T_2 (T_1>T_2). Determine the change in entropy of the universe and find an expression for the same for equal mass of water. Also prove that the change is necessarily positive.

4 (a) Explain the significance of triple point in case of pure substance.

(b) Explain in detail the formation of steam with the help of T-H diagram indicating the salient points

5 A mass of air is initially at 260^0C and 700 kPa and occupies 0.028 m^3. The air is expanded at constant pressure to 0.084 m^3. A polytropic process with n = 1.50 is then carried out, followed by a constant temperature process which completes a cycle. All the processes are reversible.
(i) Sketch the cycle on the p-v and T-s planes. (ii) Find the heat received and heat rejected in the cycle. (iii) Find the efficiency of the cycle.

6 A 5 m^3 tank has 60% hydrogen and 40% methane by volume at 100 kPa and 300 K. Determine the amount of methane to be added at 300 K to change the composition to 50% methane by volume. Also determine the final pressure of the mixture in the tank.

7 (a) Define (i) Relative humidity. (ii) Specific humidity.

(b) An air-water vapour mixture at 25^0C and 1 bar has relative humidity of 50% determine: (i) Partial pressure. (ii) Dew point temperature. (iii) Density of each constituent. (iv) Specific humidity.

8 (a) Derive an expression for an air standard efficiency of Otto cycle.

(b) Compute the changes in efficiency's of an Otto cycle when the compression ratio changes from 4 to 5. Take γ = 1.4.

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Code: 9A03302

3

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

THERMODYNAMICS

(Common to AE and ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the terms state, path, process and cyclic process.

(b) Discuss the macroscopic and microscopic point of view of thermodynamics.

2 (a) Explain in detail about constant volume gas thermometer.

(b) In a certain cyclic process, the heat interactions are + 44 kJ, -108 kJ, -32 kJ and 136 kJ. Find the net work done during cyclic process.

3 (a) Derive the expression for heat transfer in the polytropic process.

(b) 0.44 kg of air at 180^0C expands adiabatically to three times its original volume and during the process; there is a fall in temperature to 15^0C. The work done during the process is 52.5 kJ/kg. Calculate C_p and C_v.

4 (a) Define critical point and triple point.

(b) In a throttling calorimeter the pressure of the steam measure before and after throttling are 16 bar and 1 bar respectively. Find the dryness fraction of steam before passing through the calorimeter if the temperature after throttling is 150^0C. Assume C_p for superheated steam at 1 bar is 2.1 kJ/kg K.

5 2 kg of ideal gas are expanded from a pressure of 8 bar and volume 1.5 m^3 to a pressure of 1.6 bar and volume 4.5 m^3. The change in internal energy is 45 kJ. The specific heat at constant heat at constant volume for the gas is 0.70 kJ/kg K. Determine:
(i) Gas constant (ii) Index of polytropic expansion.
(iii) Work done during polytropic expansion and (iv) Initial and final temperature.

6 A perfect gas mixture consists of 2kg N_2 and 6kg CO_2 at a pressure 5 bar and temperature of 27^0C calculate (i) Mole fraction of each constituent. (ii) Equivalent molecular weight of the mixture. (iii) Equivalent gas constant of the mixture. (iv) Partial pressure and partial volumes. (v) Volume and density of the mixture.

7 (a) Define the term psychrometry and give different applications of psychrometrics.

(b) Draw a skeleton psychrometric chart and explain how to find different properties using it.

8 An air standard dual cycle has a compression ratio of 16 and the compression starts at 1 bar, 50^0C. The maximum pressure is 70 bar. The heat transferred to air at constant pressure is equal to that at constant volume. Estimate (i) The pressures and temperatures at the cardinal points of the cycle. (ii) The cycle efficiency. (iii) MEP of the cycle.

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Code: 9A03302

4

B.Tech II Year I Semester (R09) Regular and Supplementary Examinations, November 2012

THERMODYNAMICS

(Common to AE and ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Write the difference between system and control volume.

(b) A gas undergoes a reversible non-flow process according to the relation P = (- 3V + 15) where V is the volume in m^3 and P is the pressure in bar. Determine the work done when the volume changes from 3 to 6 m^3.

2 (a) What are the advantages of gases over liquids as a thermometric substances?

(b) During one cycle, the working fluid in an engine engages in two work interactions: 15 kJ to the fluid and 44 kJ from the fluid, and three heat interactions, two of which are 75 kJ of the fluid, and 40 kJ from the fluid. Evaluate the magnitude and direction of the third heat transfer.

3 (a) Describe the working of a Carnot cycle.

(b) A cyclic heat engine operates between a source temperature of 1000^0C and a sink temperature of 40^0C. Find the least rate of heat rejection per KW net output of the engine.

4 (a) Explain T-S diagram for a pure substance.

(b) Find the dryness fraction, specific volume and internal energy of steam at 7 bar and enthalpy 2550 kJ/kg.

5 (a) Show that the change in entropy during a polytropic process for a perfect gas per unit mass is given by: $s_2 - s_1 = C_v (\gamma\text{-}n/n\text{-}1) \ln (T_1/T_2)$ where n is polytropic index.

(b) Give the physical explanation of Entropy.

6 (a) Explain the methodology in converting gravimetric to volumetric analysis.

(b) The volumetric analysis of a dry flue gas in a boiler trial is given in percentage as 13% CO_2; 1.5% CO; 3.5% O_2 and 82% H_2. Determine the percentage gravimetric analysis. Also find the specific gas constant of the mixture.

7 (a) Explain any four terms associated with psychrometry.

(b) What is psychrometric chart? Draw the various lines in a skeleton psychrometric chart.

8 (a) Derive the expression for air standard efficiency of Ericsson cycle.

(b) An Ericsson cycle operating with an ideal regenerator works between 1100 K and 288 K. The pressure at the beginning of isothermal compression is 1.013 bar. Determine:
(i) The compressor and turbine work per kg of air. (ii) The cycle efficiency.

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