Code: 9A03301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MATERIALS SCIENCE AND ENGINEERING
(AE, ME, & MCT)

Time: 3 hours Max Marks: 70

1

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

1 (a) What is space lattice and list the 14 possibilities of space lattices.
(b) Aluminium crystallizes in FCC structure with a lattice parameter of 0.405nm. calculate the atomic radius of the alluminium.

2 (a) Explain the following with an example:
(i) solid solution. (ii) solute and (iii) solvent.
(b) What is an electron compound and give the electron to atom ratio for the following:
(i)Cu_3Al. (ii) Ag_5Cd_8. (iii) $AuZn_3$

3 Draw and explain the equilibrium diagram of isomorphous alloy.

4 (a) Explain how alloying elements that dissolve in ferrite increases its strength.
(b) Explain the difference in microstructure and properties of white and gray cast iron.

5 Define heat treatment. Explain full annealing process.

6 Write short notes on
(a) Duralumin.
(b) Muntz metal.
(c) Gun metal.

7 What is ceramic? Explain ceramic chloride structure.

8 Explain Dispersion strengthened composites.

*****

Code: 9A03301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MATERIALS SCIENCE AND ENGINEERING
(AE, ME, & MCT)

Time: 3 hours Max Marks: 70 **2**

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

1 (a) What is unit cell? Draw the unit cells of simple, Body centered and face centered cubic cells.
(b) Copper has an atomic radius of 0.128. Find the colume of unit cell of copper.

2 State and explain the Hume Rothery's rules.

3 Explain the experimental methods to find the data for the construction of equilibrium diagrams.

4 (a) Explain how the cast irons are classified.
(b) Distinguish between free and combined carbon.

5 Explain the importance of heat treatment process.

6 What is a Bronze? Explain Tin bronzes.

7 Describe the nature of bending of atoms in ceramic materials and discus the main features of the ceramic crystal structure.

8 Classify composites and explain laminar composites.

*****

Code: 9A03301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MATERIALS SCIENCE AND ENGINEERING
(AE, ME, & MCT)

Time: 3 hours Max Marks: 70

3

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

1 What is the atomic packing factor and find the APF for HCP unit cell.

2 (a) What is an alloy system and explain the alloying systems.
(b) What is a compound and explain the interstitial compounds.

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

4 (a) Explain the influence of alloying elements in the cast iron.
(b) Why are graphite flakes in grey castiron very often surrounded by ferrite areas.

5 Explain tempering Process.

6 Write the outstanding applications of copper.

7 Explain one of the ceramic fabrication techniques.

8 Give the uses of Laminated composites and explain the properties of Laminated composites.

*****

Code: 9A03301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MATERIALS SCIENCE AND ENGINEERING
(AE, ME, & MCT)

Time: 3 hours Max Marks: 70

4

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

1 (a) What is coordination number and give the co-ordination number of simple cubic, BCC, FCC, and HCP crystal structures.
(b) Distinguish between crystalline and amorphous solids.

2 (a) Explain the electrochemical effect to form substitutional solid solution and give an example.
(b) Classify the alloy structure.

3 (a) Draw the phase diagram for the congruent melting intermediate phase.
(b) Draw the phase diagram for Eutectic system showing the eutectic point at 70%A and 30%B.

4 Explain the malleabilization to produce malleablecast iron.

5 Compare pearlitic structure with bainitic structure.

6 Differentiate between the terms brass and Bronze.

7 What is an abrasive material? Give some application of abrasive materials.

8 Explain the applications of hybrid composites.

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Code: 9A03302 **1**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
THERMODYNAMICS
(Common to Aeronautical Engineering, and Mechanical Engineering)

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) 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: 400Kj, -365 Kj, -200 Kj and 250 Kj. The respective work transfers are 140 Kj, 0, -55Kj and 0. Is the data consistent with first law of thermodynamics.

3 (a) Define Clausius inequality and prove it.
(b) An engine operating on a Carnot cycle works with in temperature limits of 600 K and 300 K. If the engine receives 2000 Kj of heat, evaluate the work done and thermal efficiency of the engine.

4 A vessel having a capacity of 0.05 m^3 contains a mixture of saturated water and saturated steam at a temperature of 245^0C. The mass of liquid present is 10 kg. Find the following:
(i) The pressure (ii) The mass (iii) The specific volume (iv) The specific enthalpy
(v) The specific entropy (vi) The specific internal energy.

5 (a) Distinguish between a perfect gas and a real gas. Enumerate the laws formed by perfect gases.
(b) Write a note on compressibility chart.

6 (a) Determine specific heats at constant pressure and at constant volume of the mixture at 1 bar and 0^0C consisting of 1 kg of CO, 1.5 kg of CO_2, 0.5 kg of Ar and 2 kg of N_2. Compute also the partial pressure of each constituent gas.
(b) Define specific heat at constant pressure and at constant volume.

7 (a) Explain the working of sling psychrometer with the help of a neat sketch.
(b) A mixture of air and water vapour possess a volume of 700 m^3 at 1 bar and temperature of 35^0C. Its RH is 75%. Find the specific humidity, dew point, air mass and vapour mass of the mixture.

8 (a) Derive an expression for an air standard efficiency of otto cycle.
(b) Compute the changes in effiencies of an otto cycle when the compression ratio changes from 4 to 5. Take $\gamma = 1.4$

*****

Code: 9A03302 **2**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
THERMODYNAMICS
(Common to Aeronautical Engineering, and Mechanical Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) What do you understand by path function and point function? What are the exact and inexact differentials?
(b) A mass of 1.5 kg of air is compressed in a quasi-static process from 0.1 MPa to 0.7 MPa for which pv = constant. The initial density of air is 1.16 kg/m^3. Find the work done by the piston to compress the air.

2 (a) Explain in detail about constant volume gas thermometer.
(b) In a certain cyclic process, the heat interactions are +44kj, -108 kj, -32j and 136 kj. Find the network done during cyclic process.

3 0.2 m^3 of air at 1 bar and 60^0C is compressed to 0.05 m^3 according to the law $PV^{1.3}$ = K. Now the heat is added at constant volume until its pressure is 10 bar. Calculate the change in entropy in each process undergone.

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) Prove that the heat absorbed or rejected during a polytropic process is (γ-n/γ-1) x work done where γ is the ratio of specific heats and n is polytropic index.
(b) What is the difference between throttling process and free expansion process.

6 (a) Explain the methodology to convert gravimetric analysis in to volumetric analysis with the help of illustration.
(b) Explain Dalton law of partial pressures.

7 If 250 litres/sec of outdoor air at 35^0C and 24^0C WBT is mixed with 750 litres/sec of return air at 27^0C DBT and 50% RH. Find the following properties of the mixture:
(i). DBT (ii). WBT (iii). DPT (iv). Specific humidity.

8 (a) The MEP of diesel cycle is 7.5 bar and compression ratio is 12.5. Find the percentage cut-off of the cycle if its initial pressure is 1 bar.
(b) Calculate the percentage loss in the ideal efficiency of a diesel engine with compression ratio 14 if the fuel cut-off is delayed from 5% to 8%.

*****

Code: 9A03302 **3**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
THERMODYNAMICS
(Common to Aeronautical Engineering, and Mechanical Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) What is thermodynamic system? What is the difference between a closed system and an open system? Give few examples for closed and open systems.
(b) An engine cylinder has a piston of area 0.12 m^2 and contains gas at a pressure of 1.5 MPa. The gas expands according to a process which is represented by a straight line of a pressure-volume diagram. The final pressure is 0.15 MPa. Calculate the work done by the gas on the piston if the stroke is 0.03 m.

2 (a) Define and explain zeroth law of thermodynamics.
(b) Two thermometers, one Centigrade and other Fahrenhiet immersed in a fluid read the same numerical value. Find their temperature of the fluid expressed in ^0K and ^0R.

3 (a) State and explain second law of thermodynamics.
(b) 4 kg of air is compressed in a reversible steady flow polytropic process ($PV^{1.25}$= C) from 1 bar and 30^0C to 10 bar. Calculate the work input, heat transferred and the change in the entropy.

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 0.85.

5 (a) Determine compressibility factor of 0_2 at 5 bar and 30^0C.
(b) A gas having a volume of 5 m3 at 1.5 bar and 27^0C is heated at constant pressure to 57^0C. Determine mass of the gas, heat transfer by the process. Take C_P = 0.946 + 0.0001847 kJ/kgK C_V = 0.653 + 0.0001847 kJ/kgK

6 (a) Define (i). Mole fraction (ii). Mass fraction.
(b) The volumetric analysis of dry flue gas in boiler trial given in percentage as 13% $C0_2$, 1.5% CO, 3.5% O_2 and 82% N_2. Determine percentage gravimetric analysis Also find specific gas constant of the mixture.

7 (a) Establish the relation between relative humidity, degree of saturation, vapour pressure, saturated vapour pressure.
(b) Explain Psychrometric chart with 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 γ = 1.5. What is compression ratio.

*****

Code: 9A03302 **4**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
THERMODYNAMICS
(Common to Aeronautical Engineering, and Mechanical Engineering)

Time: 3 hours Max Marks: 70

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

1 A fluid contained in a horizontal cylinder fitted with frictionless leak proof piston, is continuously agitated by means of a stirrer passing through the cylinder cover. The cylinder diameter is 0.4 m. During the stirring process lasting 10 minutes, the piston slowly moves out a distance of 0.485 m against the atmosphere. The net work done by the fluid during the process is 2 KJ. The speed of the electric motor droving the stirrer is 840 rpm. Determine torque in the shaft and power output of the motor.

2 (a) Explain the limitations of first law and state the essence of second law.
(b) Prove that the formula $T^bV^{a-b}e^{kt}$ = constant for the adiabatic expansion of the gas if $C_p = a + KT$ and $C_v = b + KT$, where a, b, and k are constants and T in K.

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) a) What is a triple point? Explain.
(b) What amount of heat would be required to produce 4.4 kg of steam at a pressure of 6 bar and temperature of 250^0C from water at 30^0C. Take specific heat for super heated steam as 2.2 Kj/kg K.

5 (a) One kg of CO_2 has a volume of 0.03 m^3 and a pressure of 100 atm. Compute the temperature by (i). perfect gas equation (ii). Vanderwaals equation.
(b) Write short notes on compressibility charts.

6 (a) Assuming that air may be treated as a mixture of the ideal gases which has a mass composition 23.2% O_2 and 76.8% N_2 Find gas constant and apparent molecular weight of air.
(b) Define the following:
(i). mole fraction (ii). Mass fraction (iii). Volume fraction of constituents.

7 (a) Explain Adiabatic saturation.
(b) Prove for air- water vapour mixture, Specific humidity, $w = 0.622 (P_v/P_t-P_v)$.

8 (a) Compare Otto, diesel and dual cycles for the same compression ratio and heat rejection. Draw the corresponding pv and Ts plot.
(b) A diesel engine has a compression ratio of 14 and cut-off takes place at 6% of the stroke. Find the air standard efficiency.

*****

Code: 9A03303 **1**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
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 ACME thread profile.

(b) Sketch the conventional representation of the following
(i) External thread. (ii) Internal thread.

(c) Sketch neatly, with the help of suitable sketches the method of dimensioning
(i) circles. (ii) arcs. (iii) angles. (d) counter sinks.

2 Answer any two of the following [10x2]

(a) Draw the following views of Bushed journal bearing
(i) Front view – right half in section. (ii) Top view.

(b) Draw the sectional front view and top view of a double riveted lap joint (zig zag type). Take the diameter of the rivet=24mm.

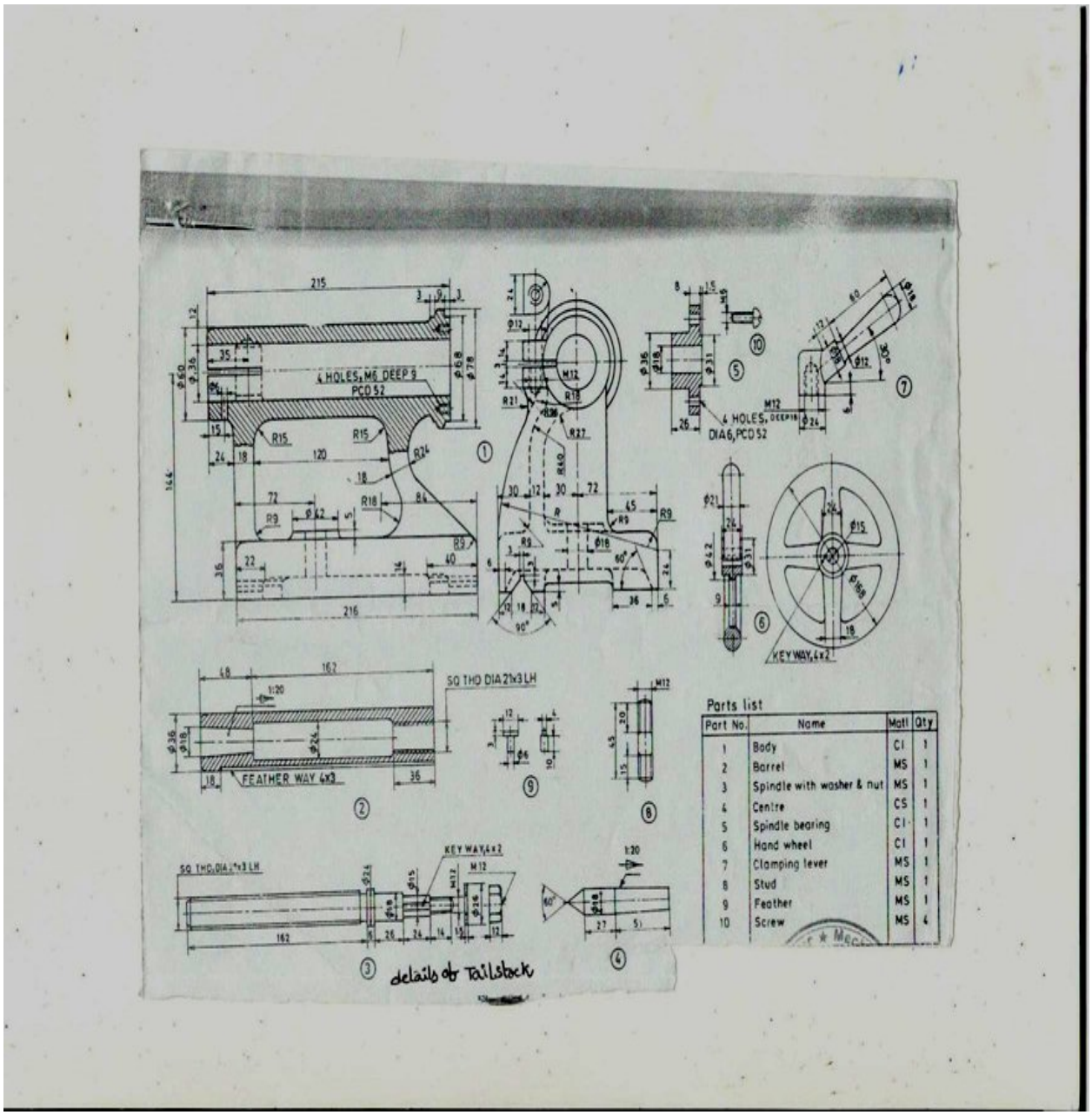
(c) Sketch the following types of keys fitted on 24mm diameter shoft
(i) Flat saddle key. (ii) Hollow saddle key. (iii) Woodruff key.

3 Figure shows the details of lathe tail stock. Assemble the parts and draw the following views. [42x1]
(i) Sectional view from the front.
(ii) View from the left.

*****

Code: 9A03303

1



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Barrel	MS	1
3	Spindle with washer & nut	MS	1
4	Centre	CS	1
5	Spindle bearing	CI	1
6	Hand wheel	CI	1
7	Clamping lever	MS	1
8	Stud	MS	1
9	Feather	MS	1
10	Screw	MS	4

Code: 9A03303 **2**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
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) Straight knurling. (ii) Splined shaft.

(b) Draw front view and top view of the hexagonal nut for a bolt of 24mm diameter.

(c) Sketch the conventional representation of any four materials.

2 Answer any two of the following [10x2]

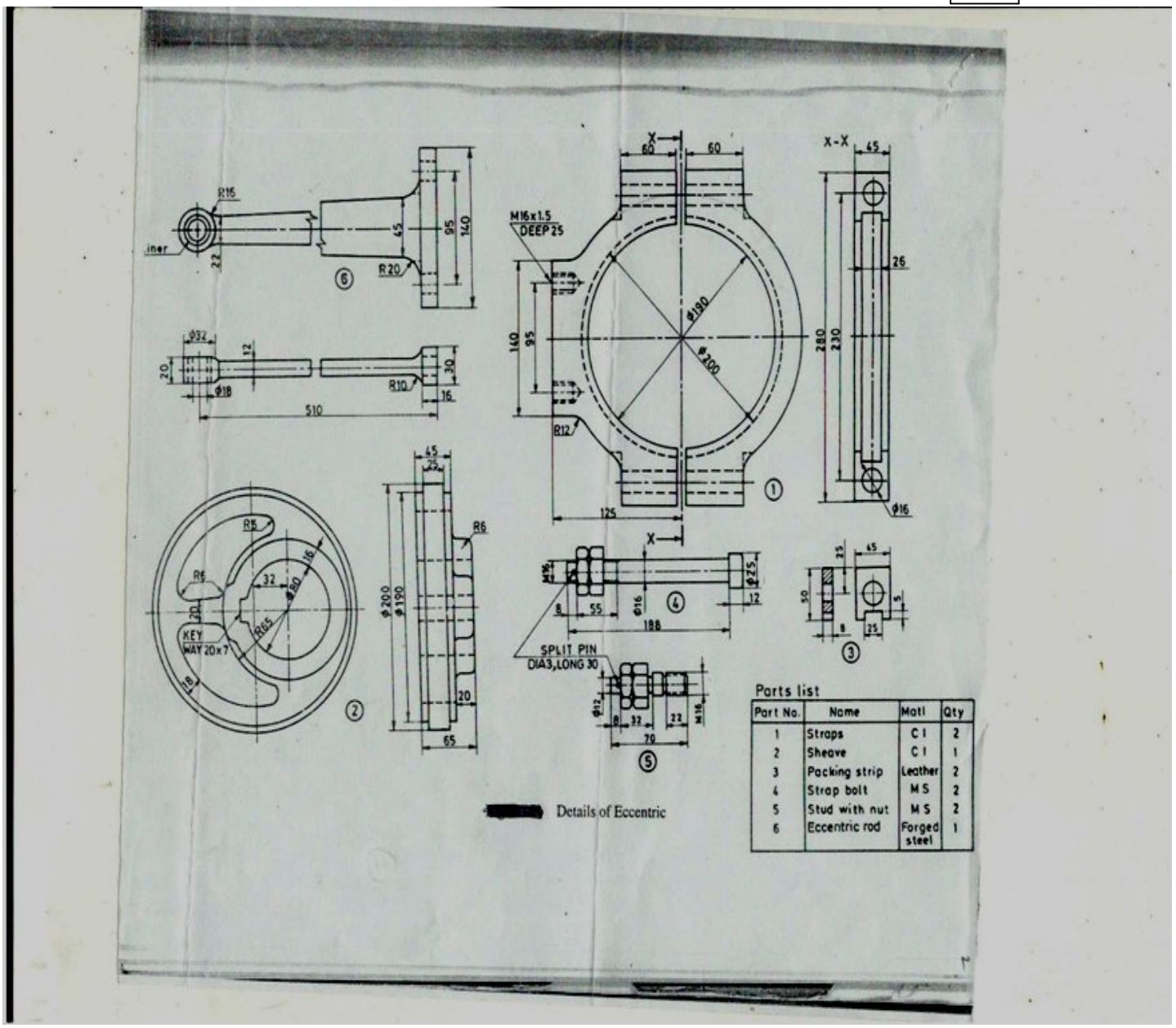
(a) Draw the top view and sectional front view of a double riveted double strap zig zag bult joint. Take the thickness of main plates= 10mm. Assuming pitch of rivets as three times the rivet diameter.

(b) Draw the following views of solid journal bearing
(i) Front view – right half in section. (ii) Top view.

(c) Draw the following views of a cotter joint
(i) Front view – upper half in section. (ii) Top view.

3 Figure shows the details of a ecentric. Assemble the parts and draw the following views. [42x1]
(i) Front view – upper half in section. (ii) Top view.

*****



Details of Eccentric

Parts list

Part No.	Name	Matl	Qty
1	Straps	C I	2
2	Sheave	C I	1
3	Packing strip	Leather	2
4	Strap bolt	M S	2
5	Stud with nut	M S	2
6	Eccentric rod	Forged steel	1

Code: 9A03303 **3**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
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 any four materials.

(b) Explain with the help of sketch
(i) Chain dimensioning. (ii) Parallel dimensioning.

(c) Sketch neatly giving proportionate dimensions draw eye foundation bolt.

2 Answer any two of the following [10x2]

(a) Draw the top view and sectional front view of a single riveted double cover bolt joint. Take the diameter of the rivet= 24mm.

(b) Draw the following views of a cotter joint with sleeve
(i) Front view – upper half in section. (ii) Top view.

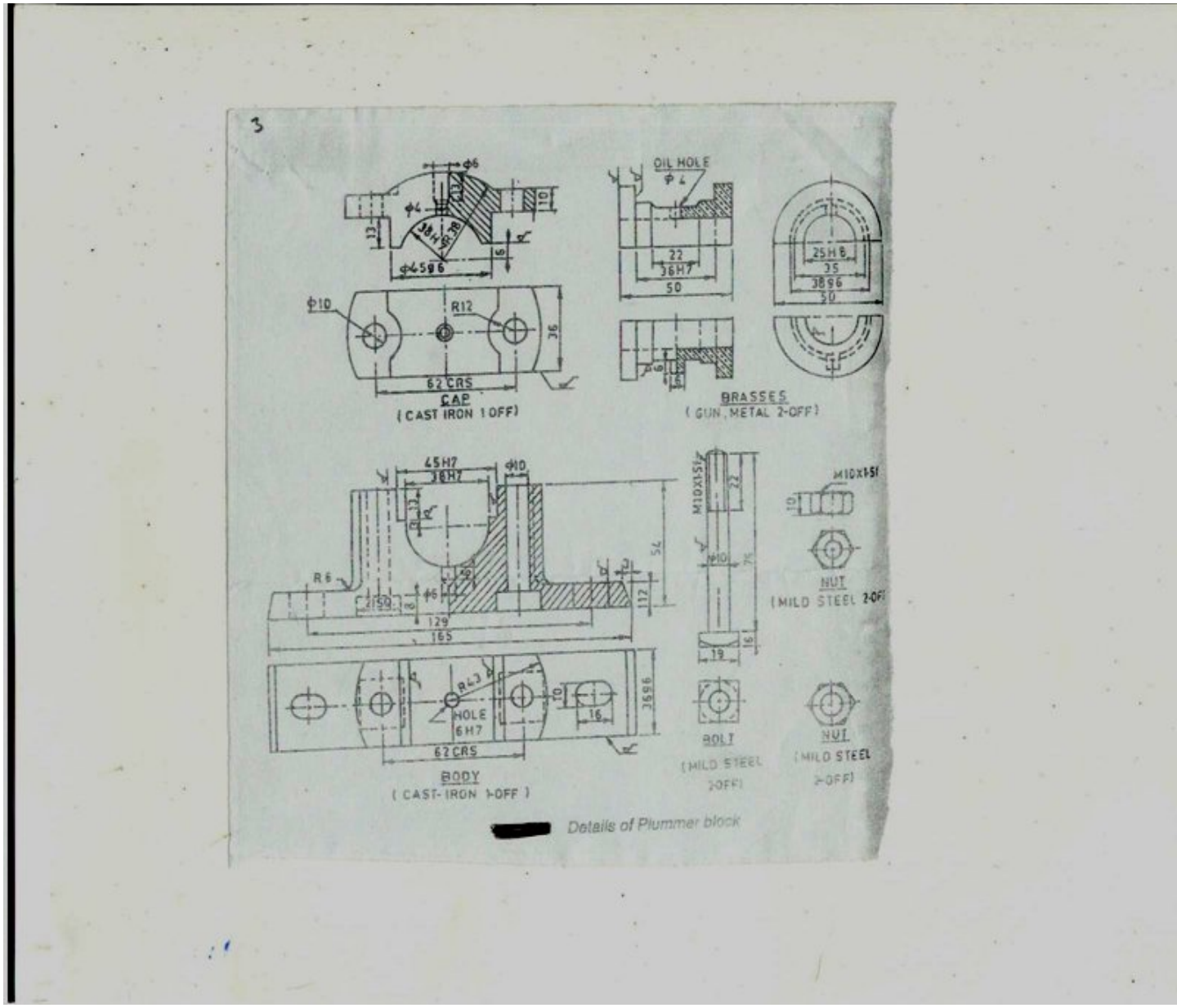
(c) Draw the front view, top view and side view of a hexagonal bolt 24mm diameter and 96mm long with a hexagonal nut and a washer.

3 Draw the following views of a Plummer block. Suitable for supporting a shaft of diameter 50mm [42x1]
(i) Half sectional view from the front, with left half in section.
(ii) View from above.

*****

Code: 9A03303

3



Code: 9A03303 **4**

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
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) External thread. (ii) Internal thread.

(b) Prepare a specimen title block for use in class room by engineering students.

(c) Sketch the two views of eye bolt (front view, side view) assume d=25mm.

2 Answer any two of the following [10x2]

(a) Draw the sectional Front view and Top view of a single riveted single cover butt joint. Take the diameter of the rivet=24mm.

(b) Draw the following views of a spigot and socket joint
(i) Full sectional view. (ii) Side view.

(c) Sketch the following thread profiles
(i) ACME thread. (ii) Knuckle thread.

3 Figure shows the details of a connecting rod for petrol engine. Assemble the parts and draw the following views. [42x1]
(i) Front view. (ii) Top view – full in section.

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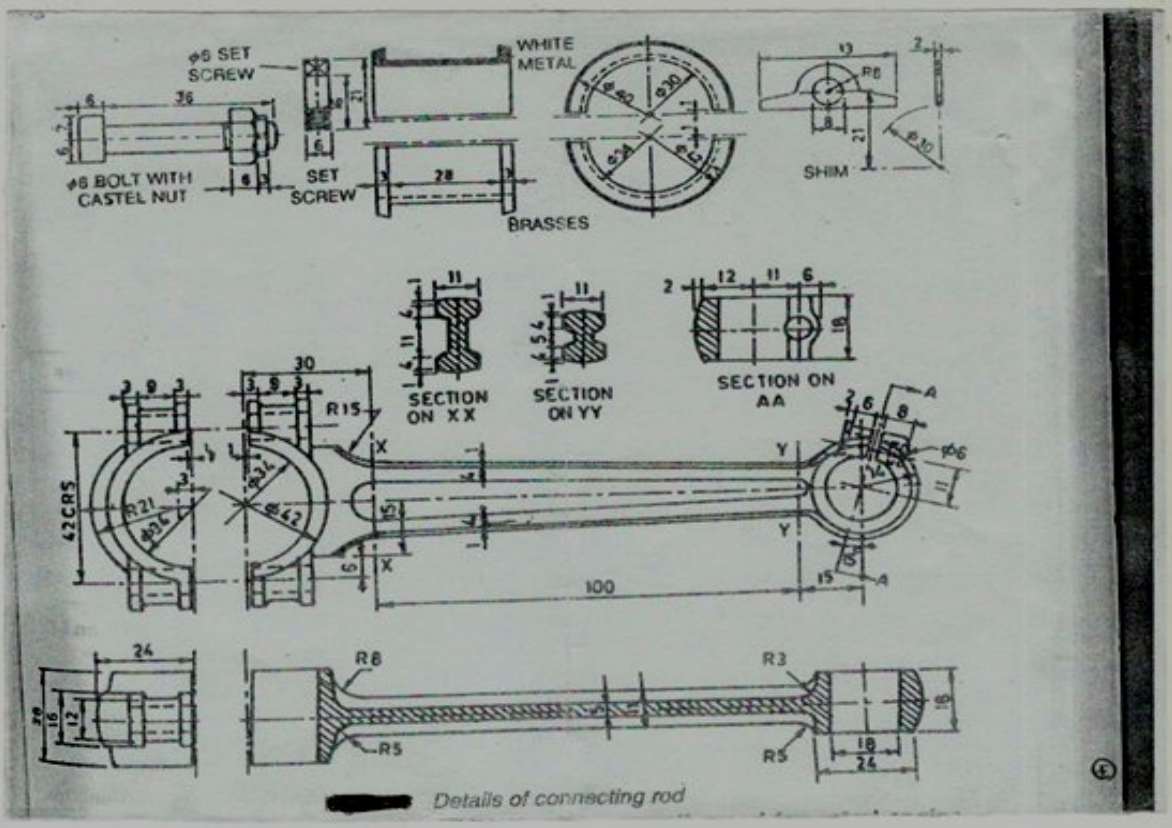
φ6 SET SCREW
WHITE METAL
φ6 BOLT WITH CASTEL NUT
SET SCREW
BRASSES
SHIM
SECTION ON XX
SECTION ON YY
SECTION ON AA
42CR5
R15
100
R8
R3
R5
Details of connecting rod

Code: 9ABS301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011

MATHEMATICS- II

(Common to AE, BT, CE, & ME)

1

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) (i) Show that the determinant of an orthogonal matrix is ± 1.

(ii) If A is any nxn matrix, then A+AT is symmetric and A-AT is skew – symmetric.

(b) Express the matrix A as a sum of the symmetric and skew – symmetric matrices, Where A =. $\begin{bmatrix} 2 & 1 & 3 \\ 1 & 1 & 4 \\ -1 & 6 & 2 \end{bmatrix}$

3 (a) Show that for $-\pi < x < \pi$,

$$\sin ax = \frac{2\sin a\pi}{\pi}\left[\frac{\sin x}{1^2-a^2} - \frac{2\sin 2x}{2^2-a^2} + \frac{3\sin 3x}{3^2-a^2} - - - -\right]$$

(b) Obtain The Fourier series for the function $f(x) = \frac{1}{2}(\pi - x)\, in\, (0, 2\pi)$

4 Find Fourier sine transform of $f(x) = \frac{1}{x(x^2+a^2)}$ and hence deduce cosine transform of $\frac{1}{x^2+a^2}$

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 a real root of the equation $x^3 - 6x - 4 = 0$ by bisection method.

(b) If $f(x) = e^{ax}$, show that $\Delta^n f(x) = (e^{ah} - 1)^n e^{ax}$

7 (a) (a) Fit a curve of the form $y = a + bx + cx^2$ for the following data:

x	10	15	20	25	30	35
y	35.5	32.4	29.2	26.1	23.2	20.5

(b) Evaluate $\int_0^6 \frac{1}{1+x}\,dx$ by using Simpson's $\frac{3}{8}$ rule.

8 Solve $\frac{dy}{dx} = x^2 + y$ with y(0) = 2 by both Picard method and Taylor series method up to third degree terms. Compute y (0.2).

*****

Code: 9ABS301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011

MATHEMATICS- II
(Common to AE, BT, CE, & ME)

Time: 3 hours Max Marks: 70

2

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

1 (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, them prove that iA is Hermitian.

2 (a) For what value of K the matrix $\begin{bmatrix} 4 & 4 & -3 & 1 \\ 1 & 1 & -1 & 0 \\ k & 2 & 2 & 2 \\ 9 & 9 & k & 3 \end{bmatrix}$ has rank 3.

(b) Find the rank of the matrix A= $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -3 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ by reducing it into echelon form.

3 (a) Find the Fourier series expansion of

$$f(x)=\begin{cases} 0 & , \quad -\pi < x < 0 \\ x & , \quad 0 < x < \pi \end{cases}$$

(b) Obtain Fourier series for the function $f(x)=\begin{cases} \pi x & 0 \le x \le 1 \\ \pi(2-x) & 1 \le x \le 2 \end{cases}$

4 Show that $\int_0^\infty \frac{\sin(ax)}{x(a^2+x^2)}dx = \frac{\pi}{2a^2}\left(1-e^{-a^2}\right)$, using Parseval identity

5 (a) Form the partial differential equation by eliminating the arbitrary function *f* from
$z = e^{ax + by} \cdot f(ax - by)$.

(b) If a string of length *l* is initially at rest in equilibrium position the velocity $v_0 \sin^3 \pi x/l$, find the displacement $y(x, t)$?

6 (a) Find the root of the equation $x^3 - 5x + 1 = 0$ using the bisection method in 5 stages.

(b) Find a real root of $x \tan x + 1 = 0$ using Newton-Raphson Method.

7 (a) 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

(b) Evaluate the following integral using Simpson's $\frac{1}{3}$ rule for *n*= 4, $\int_1^2 \frac{e^x}{x}dx$.

8 Given $\frac{dy}{dx} = \frac{y-x}{y+x}$, y(0) = 1 compute y(0.1) in step of 0.02 using Euler's modified method.

*****

Code: 9ABS301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011

MATHEMATICS- II

(Common to AE, BT, CE, & ME)

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

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Form the partial differential equation of $z = ax + by + a^2 + b^2$ by eliminating arbitrary constants.

(b) Solve $2xz_x - 3yz_y = 0$ by the method of separation of variables.

2 (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.

3 (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) Find the value of $\int_1^2 \frac{dx}{x}$ by Simpson's rule. Hence obtain approximate value of $\log_e 2$.

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

(b) Find the solution of $\frac{dy}{dx}$ = x – y ay x = m0.4 subject to the condition y = 1 at x = 0 and h = 0.1 using Milne's method. Use Euler's modified method to evaluate y(0.1).

5 (a) Find for what values of λ the equations x+y+z=1, x+2y+4z = λ, x+4y+10z = λ^2 have a solution and solve them completely in each case.

(b) Investigate for what values of λ and μ the simultaneous equations 2x+3y+5z=9, 7x+3y-2z=8, 2x+3y+ λ z = μ have

(i) no solution (ii) a unique solution (iii) an infinite number of solution.

6 (a) Show that the inverse and transpose of an orthogonal matrix are orthogonal.

(b) Express the matrix A as a sum of the symmetric and skew – symmetric matrices,Where

A =. $\begin{bmatrix} 1 & 3 & -1 \\ 2 & 5 & -2 \\ 6 & 3 & 4 \end{bmatrix}$

7 a) Expand $f(x) = x \sin x,\ 0 < x < 2\pi$ as a Fourier series

b) Prove that in $(-\pi, \pi)$, $x \cos x = \frac{-1}{2} \sin x + 2 \sum_{n=2}^{\infty} \frac{(-1)^n}{n^2 - 1} \sin nx.$

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

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

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Code: 9ABS301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MATHEMATICS- II
(Common to AE, BT, CE, & ME)

Time: 3 hours Max Marks: 70 **4**

Answer any FIVE questions
All questions carry equal marks
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1 Using Fourier integral show that

$$e^{-ax} - e^{-bx} = \frac{2(b^2 - a^2)}{\pi} \int_0^\infty \frac{\lambda \sin \lambda x \, d\lambda}{(\lambda^2 + a^2)(\lambda^2 + b^2)}, \; a, b, > 0$$

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

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

3 (a) Write the quadratic form corresponding to the matrix. $\begin{bmatrix} 0 & 1 & 2 & 3 \\ 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \end{bmatrix}$

(b) Find the nature of the quadratic form $x^2+3y^2+4z^2+2yz+4xz+2xy$.

4 (a) For what value of λ the system of equations is consistent $3x1+x2 - \lambda\, x3 =0$; $4x_1 – 2x_2 – 3x_3 =0$; $2\lambda\, x_1 + 4x_2 + \lambda\, x_3 =0$.

(b) Find the value of C, the systems of equations $2x+3cy+(3c+4)z=0$; $x+(c+4)y+(4c+2)z=0$; $x+2(c+1)y + (3c+4)z=0$, have the solutions.

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

(b) Using the method of separation of variables, solve $u_{xt} = e^{-t} \cos x$ with $u(x, 0) = 0$ and $u(0, t) = 0$.

6 (a) Find out the square root of 25 given $x_0 = 2.0$, $x_1 = 7.0$ using Bisection method.

(b) Find a real root of the equation $xe^x – \cos x = 0$ using Newton-Raphson Method.

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

x	10	12	15	23	20
y	14	17	23	25	21

(b) Evaluate $\int_0^{1/2} \left(\frac{x}{\sin x} \right) dx$, taking the step size 1/16 using Simpson's rule.

8 Use Milne's method to find y(0.8) and y(1.0) from $y' = 1 + y^2$, y(0) = 0. Find the initial values y(0.2), y(0.4) and y(0.6) from the Taylor's series method.

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Code: 9A01301

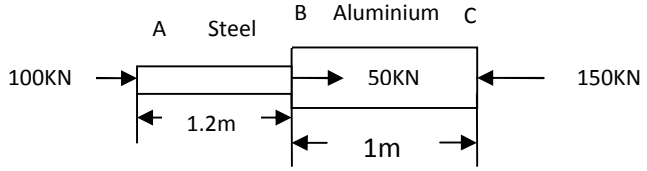
1

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MECHANICS OF SOLIDS
(Common to Aeronautical Engg & Mechanical Engg)

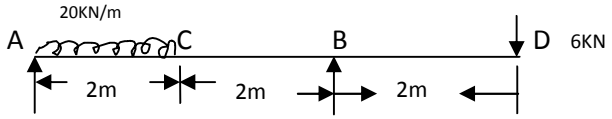
Time: 3 hours Max Marks: 70

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

1 (a) Explain the stress – strain diagram for mild steel.
(b) A member ABC is formed by connecting a steel bar of 20mm diameter to an aluminium bar of 30mm dia and is subjected to forces as shown in figure. Determine the total deformation of the bar, take $E_A=0.7X10^5$ N/mm^2. For aluminium and that for steel as $E_S=2x10^5$ N/mm^2.



2 Draw SFD and BMD indicating principal values, for an overhanging beam shown in figure.



3 A beam 500mm deep of a symmetrical section has I=1X10^{8}mm^4 and in simply reported over a span of 10m. Calculate
(a) The uniformly distributed load it may carry if the maximum bending stress is not exceed 150 N/mm^2.
(b) The maximum bending stress if the beam carries a central point load of 25KN.

4 (a) Derive the shear stress distribution over rectangular section.
(b) A rolled steel joist 200mmX160mm wide has flanges 22mm thick and web 12mm thick. Find the proportion in which the flanges and the web resist, (i) BM. (ii) S.F.

5 (a) Explain the theory of pure torsion.
(b) Derive the torsion equation – = – = —

6 (a) Derive the differential equation of the deflection curve of beam.
(b) A Cantilever of uniform section has a length AB=L. End B is free end and carries a print load w, while end A is fixed end. Find the slope and deflection at a point C, distant L/4 from the free end A.

7 A cylindrical shell 2m long and 90cm internal dia and 12mm metal thickness in subjected to an internal pressure of 1.6N/km^2. Determine
(a) Max intensity of shoal stress.
(b) Changes in the dimensions of the shell. Take E=2X10^{5}N/mm^2 and y_m=0.3.

8 A compound cylinder formed by shrinking one bite onto another, is subjected to an internal pressure of 50N/mm^2. Before the fluid in admitted, the internal and external diameters of the compound cylinder are 100mm and 180mm and the diameter at the junction is 150mm. If after striking on, the radial pressure at the common surface is 8N/mm^2, calculate the final stresses set up by the section.

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Code: 9A01301

2

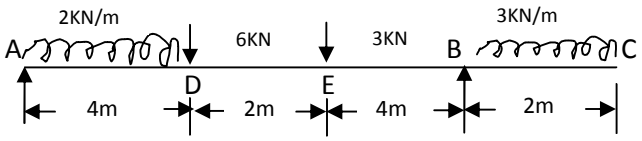
II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MECHANICS OF SOLIDS
(Common to Aeronautical Engg & Mechanical Engg)

Time: 3 hours Max Marks: 70

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

1 A copper bar 25mm diameter is completely enclosed in a steel tube, 25mm internal diameter and 40mm external diameter. A pin, 10mm in diameter is fitted transversely to the axis of the bar near each end, to secure the bar to the tube. Calculate the intensity of shear stress induced in the pin when the temperature of the whole in raised by 40k. Take $E_c=1X10^5N/mm^2$, $E_s=2X10^5N/mm^2$, $\alpha_c=18X10^{-6}$ per K, $\alpha_s=12X10^{-6}$ per K.

2 Draw the SFD and BMD for the beam shown in figure indicating the principal values.



3 (a) Explain the theory of simple bending.
(b) Derive the bending equation — = – = –

4 A beam of triangular cross – section with base 'b' and height 'h' is used with the base horizontal. Calculate the intensity of maximum shear stress and plot the variation of shear stress intensity over the section.

5 A solid shaft of 250mm diameter has the same cross – sectional area as the hallow shaft of the same material with inside diameter of 200mm.
(a) Find the ratio of power transmitted by the two shafts for the same angular velocity.
(b) Compare the angles of twist in equal lengths of these shafts, when stressed to the same intensity.

6 A simply supported beam of span 8m carries a point load of 20KN at a distance of 6m from the left end. Compute
(a) The slope at the left end.
(b) The deflection under the load.
(c) The deflection at the mid – span.
(d) The maximum deflection and its location. Take $E=2X10^5N/mm^2$ and $I=6X10^8mm^4$.

7 A thin cylinder, 150mm internal diameter and 2.5mm thick, has its ends closed by rigid plates and in then filled with water. When an external axial pull of 37KN in applied to the ends, the water pressure is observed to fall by $0.1N/mm^2$. Determine the value of poison's ratio. $E=140000N/mm^2$ and $K=2200N/mm^2$.

8 Write short notes on
(a) Compound cylinders.
(b) Shrink fit allowance.

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Code: 9A01301

3

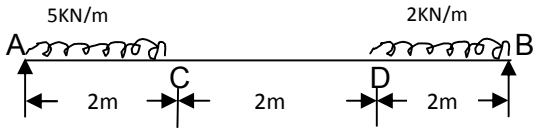
II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MECHANICS OF SOLIDS
(Common to Aeronautical Engg & Mechanical Engg)

Time: 3 hours Max Marks: 70

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

1 (a) Explain the various Elastic modules.
(b) Derive the relationship between E, N, K and M.

2 A simply supported beam of 6m span in loaded as shown in figure. Draw BMD and SFD including principal values.

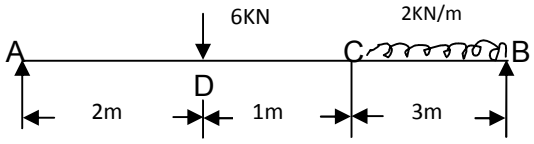


3 A timber beam of rectangular section is to support a load of 20KN over a span of 4m. If the depth of the section is to be twice the breadth, and the stress in the timber is not to exceed 60N/mm^2, find the dimensions of the cross – section. How would you modify the cross – section of the beam it it were a concentrated load placed at the centre with the same ratio of breadth to depth.

4 (a) Derive the formula and sketch the shear stress distribution over solid circular section.
(b) A beam of square section is used as a beam with one diagonal horizontal. Find the magnitude and location of maximum shear stress in the beam. Also sketch the shear stress distribution across the section.

5 A hallow steal shaft 5m long in to transmit 160Kw of power at 120 rpm. The total angle of twist is not to exceed 2^0 in this length and the allowable shear stress is 50N/mm^2. Determine the inside and outside diameters of the shaft, taking N=0.8X10^{5}N/mm^2.

6 A beam AB of 6m span in simply supported at the ends and in loaded as shown in figure. Determine (i) deflection at C. (ii) Maximum deflection. (iii) Slope at end A. Take E=2X10^{5}N/mm^2 and I=2000cm^4.



7 A copper tube, 38mm external diameter, 35.5mm internal diameter, is closely wound with steal wire 0.75mm diameter. Stating clearly the assumptions made, estimate the tension at which the wire must have been wound if an internal pressure of 2N/mm^2 produces a tensile circumferential stress of 6.5N/mm^2 in the tube. Take E_s=1.6 E_c.

8 A compound thick cylinder is formed by thinking a tube of external diameter 300mm over another tube of internal diameter 150mm. After shrinking, the diameter at the junction of the tube is found to be 250mm and radial compression as 28N/mm^2, find the original difference in radii at the junction. Take E=2X10^{5}N/mm^2.

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Code: 9A01301

4

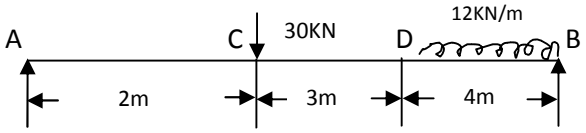
II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
MECHANICS OF SOLIDS
(Common to Aeronautical Engg & Mechanical Engg)

Time: 3 hours Max Marks: 70

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

1 A Bar shown in figure is subjected to a tensile force of 200KN at each end. Find
(a) The diameter of the middle portion if the stress in the middle portion is limited to 150N/mm^2.
(b) The length of the individual portions if the total elongation of the bar is limited to 0.30mm. Take E=200KN/mm^2.

2 A Simply supported beam of 9m span is loaded as shown in figure. Draw BMD and SFD indicating principal values.

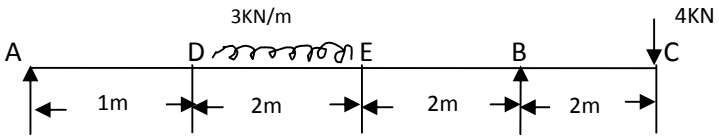


3 (a) Write the assumptions of theory of simple bending.
(b) A 100mm X 200mm rolled steel joist of I – section has flanges 12mm thick and web 10mm thick. Find the safe u.d.l. that this section can carry over a span of 6m if the permissible skin stress in limited to 160N/mm^2.

4 A rolled steel joist 300mm deep and 200mm wide has flange 16mm thick and web 12mm thick. Calculate the proportion in which the flange and web resist
(a) B.M. (b) Shear force.

5 (a) State and explain the assumptions made in the theory of pure torsion.
(b) Find the maximum torque that can be safely applied to a shaft of 200mm diameter if the permissible angle of twist is 1^0 in a length of 5m and the permissible shear stress is 45N/mm^2. Take N=0.8X10^{5}N/mm^2.

6 An overhanging beam ABC is loaded as shown in figure. Determine the deflection at the free end, and the maximum deflection between A and B. Take I-600cm^4 and E=2X10^{5}N/mm^2.



7 What are the stresses induced in the thin cylindrical shell subjected to internal pressure? Explain and derive them.

8 State and explain Lame's theory for thick cylindrical shells. Derive the Lame's equations.

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Code: 9A02301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING
(Common to Aeronautical Engg & Mechanical Engg)

Time: 3 hours Max Marks: 70

1

(Minimum of two questions from each part should be chosen for answering five questions)
All questions carry equal marks

*****

PART - A

1 (a) Define and explain Kirchhoff's laws.
(b) Three resistors 5Ω, 10Ω and 15Ω are connected in parallel. If the current is 10Ω resistor is 3A what is the current in other resistor and total current.

2 (a) Derive the torque equation of DC motor.
(b) A six pole lap wound armature has 840 conductors and flux per pole of 0.018wb. Calculate the emf generated when the machine is running at 600rpm.

3 (a) Derive the emf equation of single phase transformer.
(b) A 100KVA, 1000/10000V_1 50Hz, 1-Φ transformer has an Iron loss of 1100w. The copper loss with 5A in the high voltage winding is 400w. Calculate the efficiency at 25% of load at power factor 1.0.

4 (a) Explain the principle of operation of induction motor.
(b) Define the regulation of an alternator and explain how will you find the regulation by synchronous impedance method.

PART – B

5 (a) With the help of neat sketches explain the potential distribution in an open circuited p-n junction.
(b) Compare half wave and full wave rectifiers.

6 (a) Explain the potential divider bias for a transistor.
(b) The source and load resistances connected to a BJT amplifier in CE configuration are 680Ω and 1kΩ respectively. Calculate the voltage gain A_v and input resistance R_i if the h parameters are listed as h_{ie}=1.1kΩ, $h_{re}=2x10^{-4}$, h_{fe}=50 and h_{oe}=20μ℧. Use both approximate and exact analysis.

7 (a) Explain the principle of induction heating and its applications.
(b) Explain any one method of generation of ultrasonics.

8 Explain working and function of each block of CRO with the help of block diagram.

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Code: 9A02301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING
(Common to Aeronautical Engg & Mechanical Engg)

Time: 3 hours Max Marks: 70 **2**

(Minimum of two questions from each part should be chosen for answering five questions)
All questions carry equal marks

*****

PART - A

1 (a) Define and explain ohm's law.
(b) Two resistances 1.5Ω and 3.5Ω are connected in parallel and the combination is connected in series with a resistance of 1.95Ω. Find the equivalent resistance of the circuit. What current will it draw of it is connected to a 30v supply.

2 (a) Explain the principle of operation of DC Generator.
(b) A 4 pole DC Generator has 378 wave wound conductors is its armature. If the flux per pole in 0.02wb and the generator runs at 1000rpm. Calculate the induced emf.

3 (a) Define efficiency and regulation 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 600w. Determine the efficiency at 80% of full load.

4 (a) Briefly explain slip-torque characteristics of induction motors.
(b) Explain the principle of operation of Alternators.

PART – B

5 (a) What is the dynamic characteristic of a diode? How do you obtain it form the static characteristic?
(b) Derive expressions for transition and diffusion capacitances of a p-n diode.

6 (a) Describe how h_{fe} and h_{ie} can be determined from BJT characteristics.
(b) Compare the characteristics of a BJT in CB, CE and CC configurations.

7 (a) Briefly explain about dielectric heating and its applications.
(b) Explain how flaw detection in obtained using ultrasonic's.

8 (a) Explain the vertical and horizontal deflection systems with the help of block diagrams.
(b) Compare dual beam and dual trace CROs.

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Code: 9A02301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING
(Common to Aeronautical Engg & Mechanical Engg)

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

(Minimum of two questions from each part should be chosen for answering five questions)
All questions carry equal marks

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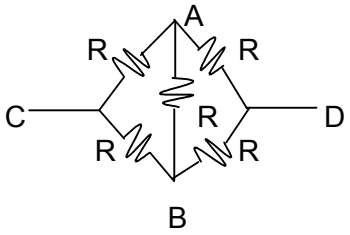
PART - A

1 (a) Explain the types of elements in detail.
(b) Find the equivalent resistance between C and D by using Star – Delta transformation.



2 (a) Explain the operation of 3 – point starter with neat diagram.
(b) A 4-pole DC shunt generator with lap-connected armature supplies a load of 100A at 200V. The armature resistance in 0.1Ω and shunt field resistance is 80Ω. Find total armature current and emf generated.

3 (a) Explain the principle of operations of single phase transformer.
(b) A 3300/220V, 30KVA, 1-Φ transformer takes a no load current of 1.5A when the low voltage winding in open. The Iron loss component is 0.4A. Find
(i) No load input power. (ii) Magnetising component.
(iii) Power factor of no load current.

4 Explain how will you find the regulation by synchronous impedance method with neat circuit diagram.

PART – B

5 (a) An ac supply of 220V is applied to a full wave rectifier circuit through a transformer of turns ratio 5:1. The load resistance is 200Ω. Find dc output voltage, and average power delivered to the load.
(b) Explain break down in p-n junction diodes.

6 (a) What is a bipolar transistor? How are its terminals named?
(b) Describe the functioning of a BJT in common base configuration.

7 (a) Explain the operation of coreless induction heating with neat sketch.
(b) List the various applications of ultrasonics.

8 (a) Derive an expression for electromagnetic deflection sensitivity of CRT.
(b) Write a short notes on dual trace CRO by using block diagram.

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Code: 9A02301

II B.Tech I Semester (R09) Regular & Supplementary Examinations, November 2011
ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING
(Common to Aeronautical Engg & Mechanical Engg)

Time: 3 hours Max Marks: 70

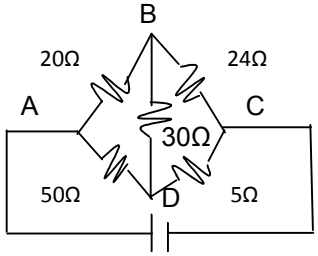
4

(Minimum of two questions from each part should be chosen for answering five questions)
All questions carry equal marks

*****

PART - A

1 (a) Explain the active elements in detail.
(b) Determine the current delivered by the 220V battery.



2 (a) Derive the emf equation of DC generator.
(b) A 220V DC shunt motor takes a total current of 100A and runs at 750rpm. The resistance of the armature winding and of shunt field winding in 0.1Ω and 40Ω respectively. Find the torque developed by armature.

3 (a) Explain the losses that occur in transformers.
(b) A 1-Φ transformer has 350 primary and 1050 secondary turns. The cross sectional area of the core is 55cm^2. If the primary is connected to 400V, 50Hz supply. Calculate the maximum value of flux density in the core and the voltage induced in the secondary winding.

4 (a) Explain the principle of operation of alternators.
(b) A 3-Φ induction motor runs at 1200 rpm at no load and 1140 rpm at full load when supplied with power from a 60Hz, 3 phase line. Calculate number of poles and slip at full load.

PART – B

5 (a) Explain the operation of silicon p-n junction diode and obtain the V-I characteristics.
(b) Derive the expressions for ripple factor of a full wave rectifier with and without a capacitive filter.

6 (a) With the help of hybrid equivalent circuit of a BJT amplifier derive expressions for voltage gain and current gain when the source and load resistances of finite values are connected.
(b) Draw the circuit diagram of npn transistor as an amplifier with self bias and explain its working.

7 (a) Explain how dielectric heating is used for different applications
(b) Explain briefly about ultrasonic welding.

8 (a) In a CRT the distance between the deflection plates is 1cm, the length of the deflection plates is 4.5cm and the distance of screen from the centre of the deflection plated is 33cm. If accelerating voltage is 3000V. Calculate
(i) Beam speed. (ii) Deflection sensitivity. (iii) Reflection factor.
(b) Explain how a CRO is used to measure the phase difference between two sinusoidal waves and also frequency of the unknown sine wave form.

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