Code: 9A03301

R09

II B. Tech I Semester (R09) Supplementary Examinations, May 2012

MATERIALS SCIENCE & ENGINEERING

(Common to AE, ME & MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Explain briefly the ionic and covalent bonds with examples.
(b) Define the atomic packing factor and find the APF for simple cubic unit cell.

2 (a) What are the impurities in iron and explain the effect of each?
(b) What is a compound and explain the inter metallic compounds?

3 (a) What is an equilibrium diagram and explain the importance of it?
(b) Explain the steps involved in the construction of binary equilibrium diagram using cooling curves.

4 (a) Distinguish between white cast-iron and malleable cast-iron.
(b) Discuss the Hadfield manganese steels.

5 Define heat treatment. Explain full annealing process.

6 Write the properties of copper and explain why copper is a suitable material for automobile radiators.

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

8 Explain Polymer-Matrix Composites (P.M.C).

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Code: 9A03302

R09

II B. Tech I Semester (R09) Supplementary Examinations, May 2012

THERMODYNAMICS

(Common to AE, ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Define a thermodynamic system. Differentiate between open system, closed system and an isolated system.

(b) Determine the work done by the air which enters into an evacuated vessel from atmosphere when the valve is opened. The atmospheric pressure is 1.013 bar and 1.5 m^3 of air at atmospheric condition enters into the vessel.

2 (a) State the zeroth law of thermodynamics. Explain how it forms the basis for temperature measurement.

(b) A closed system undergoes a thermodynamic cycle consisting of four separate and distinct processes. The heat and work transferred in each process are as tabulated below.

Process	Heat transfer in Kj/min	Work done in Kj/min
1-2	20,000	0
2-3	-10,000	30,000
3-4	0	20,000
4-1	15,000	-25,000

Show that the data is consistent with the first law of thermodynamics. Also evaluate the net work output in KW and the change in internal energy.

3 (a) State and explain second law of thermodynamics.

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

4 (a) Describe the process of formation and give its graphical representation.

(b) Steam enters an engine at a pressure 10 bar absolute and 250^0 C. It is exhausted at 0.2 bar. The steam at exhaust is 0.9 dry. Find: (i) Drop in enthalpy. (ii) Change in enthalpy.

5 Derive the work transfer equations for various Quasi-static processes.

6 35 two tanks are connected by a valve. One tank contains 2 kg of CO_2 gas at 77^0 C and 0.7 bar. The other tank holds 8 kg of the same gas at 27^0 C and 1.2 bar. The valve is opened and the gases are allowed to mix while receiving energy by heat transfer from the surroundings. The final equilibrium temperature is 42^0C. Using the ideal gas model, determine:
(i) The final equilibrium pressure. (ii) Heat transfer for the process.

7 (a) What do you mean by adiabatic mixing of air streams? Show the process on a psychrometric chart.

(b) What is the basic difference between refrigeration and air-conditioning? Explain the parameters involved in the air-conditioning processes.

8 (a) What do you mean by air standard cycles? What are the assumptions for an air standard cycle?

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

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Code: 9A03303

R9

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2012

MACHINE DRAWING

(Mechanical Engineering)

Time: 4 hours Max Marks: 70

All answer should be on the drawing sheet only

Answers on the drawing sheet only will be valued

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Section – I
(Answer any two) 2x4=08 M

1 Explain with the help of sketches:
(a) Chain dimensioning.
(b) Parallel dimensioning.

2 Sketch the conventional representation of any four materials.

3 Sketch the conventional representation of external and internal threads.

Section – II
(Answer any two) 2x10=20 M

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

5 Draw the following thread forms:
(a) Knuckle thread.
(b) Acme thread.

6 Draw the sectional front view and top view of a bushed journal bearing.

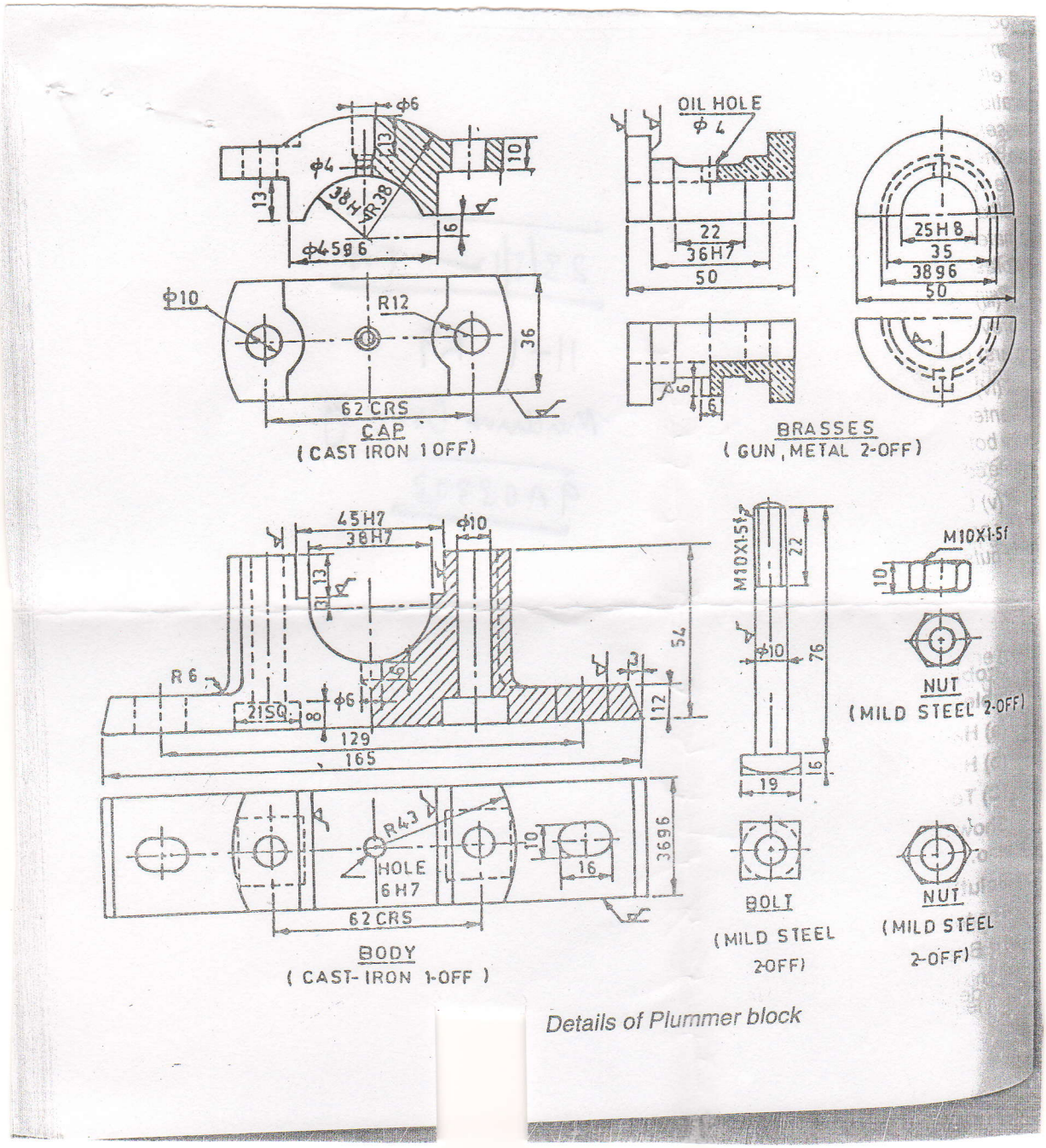
Section – III 1x42=42 M

7 Draw the following views of a plummer block suitable for supporting a shaft of diameter 50 mm.
(a) Half sectional front view.
(b) Top view.

See figure in page number 2

Code: 9A03303

R9



Details of Plummer block

Code: 9ABS301

R09

II B. Tech I Semester (R09) Supplementary Examinations, May 2012

MATHEMATICS - II

(Common to AE, BT, CE & ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 0 \\ 3 & 1 & 2 \end{bmatrix}$ by reducing it to normal form.

(b) Determine the rank of the matrix A = $\begin{bmatrix} -2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ by reducing it to normal form.

2 (a) Reduce the quadratic form $17x_1^2 - 30x_1x_2 + 17x_2^2$ to canonical form.

(b) Determine the nature, index and signature of the quadratic form: $x_1^2 + 2x_2^2 + 3x_3^2 + 2x_2x_3 - 2x_3x_1 + 2x_1x_2$.

3 (a) Expand f(x) = x as a half – range cosine series in (0, 2).

(b) Find a Fourier sine series of $f(x) = k \ in \ (0, \pi)$.

4 (a) Find the finite Fourier sine and cosine transforms of $f(x) = 1 \ in \ (0, c)$.

(b) Find the finite Fourier sine transform of $f(x) = x^2 \ in (0, \pi)$.

5 (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.

6 Using Newton-Raphson method:
(i) Find square root of a number. (ii) Find reciprocal of a number.

7 (a) Find a weighted least square parabola for the following data by choosing the weights 1, 4, 2, 4 and 1 respectively:

x	0	2	3	4	5
y	-1	1	7	17	31

(b) The population of a certain town is shown in the following table:

Year	1931	1941	1951	1961	1971
Population y(x)	40.62	60.80	79.95	103.56	132.65

Find the growth rate of the population in the year 1931.

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).

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Code: 9A01301

R9

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2012

MECHANICS OF SOLIDS

(Common to AE, ME and MCT)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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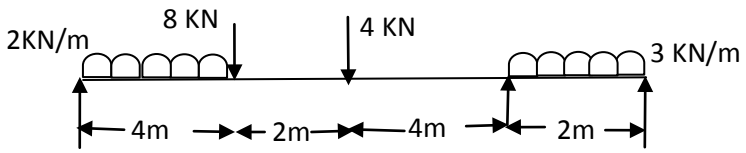
1 Explain stress strain diagram for mild steel.

2 Draw the S.F. and B.M. diagram for the beam shown in figure indicating principal values.



3 (a) Write the assumptions in the theory of simple bending.
(b) State and prove the theory of simple bending.

4 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 State the assumptions and derive the theory of pure torsion $\frac{f_s}{R} = \frac{q}{r} = \frac{N\theta}{L}$.

6 A simply supported beam of span 10 m carries a point load of 30 KN at a distance of 4 m from the left end, compute: (i) The slope at the left end (ii) The deflection under the load (iii) The deflection at the mid-span and (iv) The maximum deflection and its location.TakeE = $2x10^5$ N/mm^2 and I = 6 x 10^8 mm^4.

7 A copper tube, 38 mm external diameter, 35.5 mm internal diameter, is closely wound with steel wire 0.75 mm dia. Stating clearly the assumptions made, estimate the tension at which the wire must have been wound if an internal pressure of 2 N/mm^2 produces a tensile circumferential stress of 7 N/mm^2 in the tube. Take $E_s = 1.8\ E_c$.

8 A compound cylinder, formed by shrinking one tube on to another, is subjected to an internal pressure of 60 N/mm^2. Before the fluid is admitted, the internal and external diameter of the compound cylinder are 100 mm and 180 mm, and the diameter at the junction is 150 mm. If after shrinking on, the radial pressure at the common surface is 12 N/mm^2, calculate the final stresses setup by the section.

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Code: 9A02301

R9

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2012

ELECTRICAL ENGINEERING AND ELECTRONICS ENGINEERING

(Common to AE and ME)

Time: 3 hours Max Marks: 70

A minimum of two questions from each part should be chosen for answering five questions

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PART – A (Electrical Engineering)

1 (a) State and explain Kirchhoff's laws.
(b) Three resistances 2 Ω, 4 Ω and 6 Ω are connected in series across 24 V supply.

2 (a) Derive the emf equation of DC generator.
(b) A 6-pole, lap wound armature has 840 conductors and flux per pole of 0.018 wb. Calculate the emf generated when the machine is running at 600 rpm.

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

4 (a) Explain the principle of operation of induction motor.
(b) Explain the slip-torque characteristics of induction motor.

PART – B (Electronics Engineering)

5 (a) Explain in detail the operation of PN-junction diode and its characteristics.
(b) With a neat circuit explain the operation of half wave rectifier circuit.

6 (a) Explain in detail about frequency response of CE amplifier.
(b) Explain different applications of SCR.

7 Explain the concept of induction heating and also discuss about various industrial applications of induction heating.

8 Derive the expression for electro static deflection of CRO.

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