Code: 9A03302

R09

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2013

THERMODYNAMICS

(Common to AE and ME)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) What is a quasi-static process? What is its characteristic feature?

(b) An engine cylinder has a piston of area 0.12 m^3 and contains gas at a pressure of 1.5 MPa. The gas expands according to a process which is represented by a straight line on 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 0.3 m.

2 (a) Make a comprehensive energy analysis of the steam turbine.

(b) The gas leaving the turbine jet engine flows steadily into the jet pipe with enthalpy 960 kJ/kg and velocity 250 m/s. The exit from the pipe is at enthalpy 860 kJ/kg and exhaust is in line with intake. Neglecting heat loss from the system. Determine the velocity of gas leaving the pipe.

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

(b) A cyclic heat engine operated between a source temperature of 900^0C and a sink temperature of 50^0C. What is the least rate of heat rejection per KW net output of 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) Explain the methodology to convert gravimetric analysis in to volumetric analysis with the help of illustration.

(b) Explain Dalton law of partial pressures.

7 Atmospheric air at 20^0C and 40% RH enters a heating coil whose temperature is 38^0C. The by-pass factor of heating coil is 0.25. Compute dry bulb temperature, relative humidity and wet bulb temperature of the air leaving the heating coil. The atmospheric air is at 1 bar.

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

(b) An engine working on Lenoir cycle with adiabatic index 1.25 and compression ratio is 16. Calculate the efficiency.

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Code: 9A03303 **R9**

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2013

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 Sketch the conventional representation of :
(a) Straight knurling.
(b) Splined shaft.

2 Prepare a specimen title block for use in class room by engineering students.

3 Sketch neatly with help of suitable sketches the methods of dimensioning.
(a) Circles.
(b) Area.
(c) Angler.
(d) Counter sinks.

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

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

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

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

Section – III 1x42=42 M

7 Figure shows the details of a eccentric. Assemble the parts and draw the following views:
(a) Front view – upper half in section.
(b) Top view.

Contd. in Page 2

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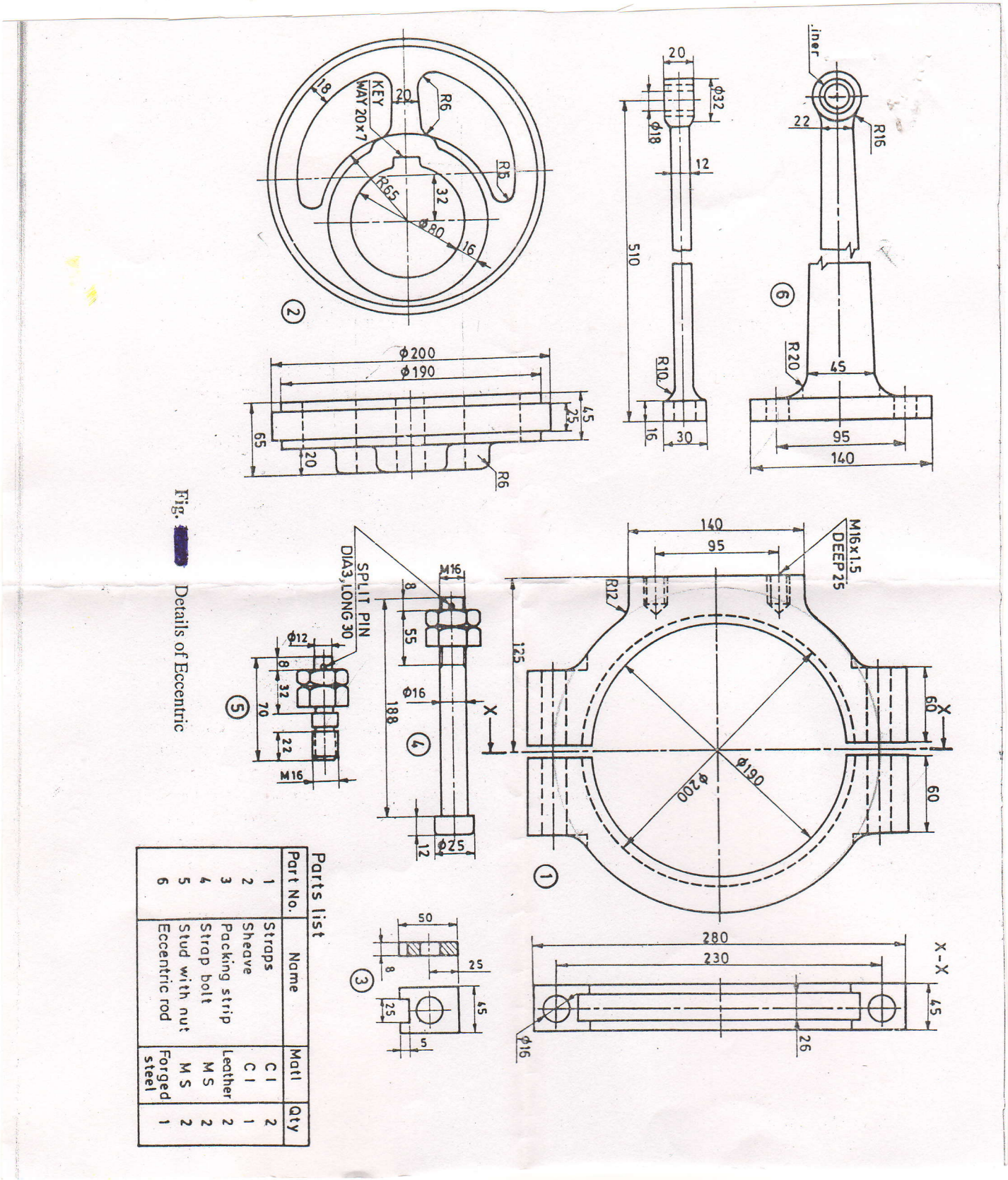

Fig. Details of Eccentric

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

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Code: 9ABS301

R09

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2013

MATHEMATICS - II

(Common to AE, BT, CE and ME)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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

2 (a) Prove that every square matrix is uniquely expressed as the sum of a Hermitian matrix and Skew-Hermitian matrix.

(b) Find the Eigen vectors of the Hermitian matrix A =. $\begin{bmatrix} a & b+ic \\ b-ic & k \end{bmatrix}$.

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

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

4 Using Fourier integral show that $e^{-ax} - e^{-bx} = \frac{2(b^2-a^2)}{\pi}\int_0^{\infty}\frac{\lambda \sin\lambda x\, d\lambda}{(\lambda^2+a^2)(\lambda^2+b^2)}$, $a, b, > 0$.

5 A string of length L is fastened at both ends *A* and *C*. At a distance '*b*' from the end *A*, the string is transversely displaced to a distance 'd' and is released from rest when it is in this position. Find the equation of the subsequent motion.

6 (a) Find the roots of the equation $x^3 - 4x + 1 = 0$ using Bisection method.

(b) Given *x* = 1, 2, 3, 4 and f(*x*) 1, 2, 9, 28 respectively find f(3.5) using 'Lagrange' method of 2nd and 3rd order degree polynomials.

x	1	2	3	4
f(x)	1	2	9	28

7 Find the area bounded by the curve $y = x^3 - x + 1$, *x*-axis between *x* = 0 and *x* = 1.2 by

(i) Trapezoidal rule. (ii) Simpson $\frac{1}{3}$ rule. (iii) Simpson $\frac{3}{8}$ Rule and compare the results.

8 Employ Taylor's series method to obtain approximate value of y(1.1) and y(1.3), for the differential equation $y' = xy^{1/3}$, y(1) = 1. Compare the numerical solution obtained with exact solution.

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Code: 9A01301

R09

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2013

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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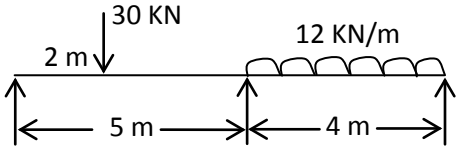
1 (a) Derive the relationship between the elastic moduli.

(b) A reinforced short concrete column 250 mm × 250 mm in section is reinforced with 8 steel bars. The total area of steel bars in $2500\ \mathrm{mm}^2$. The column carries a load of $390\ \mathrm{kN}$. If the modulus of elasticity for steel is 15 times that of concrete; find the stresses in concrete and steel.

2 Draw the bending moment and shear force diagrams for S.S. beam shown in figure indicating the principal values.



3 State the assumptions in theory of simple bending. Derive the expression for bending stress.

4 Derive an expression for the shear stress at any point in a circular section of a beam, which is subjected to a shear force F.

5 Derive an expression for the shear stress produced in a circular shaft which is subject to torsion. What are the assumptions made in the derivation?

6 Determine:

(i) Slope at the left support.

(ii) Deflection under the load.

(iii) Maximum deflection of a simply supported beam of length 5 m, which is carrying a point load of 5 KN at a distance of 3 m from the left end.

Take $\mathrm{E} = 2 \times 10^5\ \mathrm{N/mm^2}$ and $\mathrm{I} = 1 \times 10^8\ \mathrm{mm^4}$.

7 A cylindrical shell 3 m long which is closed as the ends has an internal diameter of 1 m and a wall thickness of 15 mm. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected an internal pressure of $1.5\ \mathrm{N/mm^2}$. Take $\mathrm{E} = 2 \times 10^5\ \mathrm{N/mm^2}$ and $\frac{1}{\mathrm{m}} = 0.3$.

8 Write short notes on:

(a) Thick cylinders subjected to inside pressures.

(b) Mohr's theorems.

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Code: 9A02301 R09

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2013

ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING

(Common to AE & ME)

Time: 3 hours Max. Marks: 70

All questions carry equal marks

A total of five questions are to be answered with at least two questions from each part

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) Briefly explain the types of passive elements.

2 (a) Derive the emf equation of DC generator.
(b) Explain the operation of 3-point starter used in DC motors with neat diagram.

3 (a) Explain the principle of operation of single phase transformers.
(b) Define and explain efficiency and regulation of single phase transformers.

4 (a) Explain the principle of operations of 3-phase induction motors.
(b) Explain the method of finding regulation of an alternator by synchronous impedance method.

PART - B

5 (a) Draw the energy band diagram of p-n diode for no bias, forward bias and reverse bias and explain.
(b) Explain the circuit diagram of a full-wave bridge rectifier and sketch the input and output wave forms.

6 (a) Describe a set up to obtain the output characteristics of a transistor in CE configuration. Indicate the various regions of operation on the output characteristics.
(b) What do you mean by feedback? Define positive and negative feedback. What are the advantages of negative feedback?
(c) What are the necessary conditions to sustain oscillations?

7 (a) Explain the principle of dielectric heating.
(b) Briefly describe the following applications of induction heating:
(i) Surface hardening of steel. (ii) Brazing.

8 (a) With the help of a block schematic, explain the working of a CRO and what are the applications of CRO.
(b) Derive the expression for the electrostatic deflection sensitivity in a CRT.

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Code: 9A03301

R09

B. Tech II Year I Semester (R09) Supplementary Examinations, May 2013

MATERIAL SCIENCE & ENGINEERING

(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 (a) Describe the reasons for high thermal and electrical conductivity in metallic bonded solids.
(b) Explain the comparison method of estimating the grain size.

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

3 (a) Classify and explain transformations in the solid state.
(b) What is incongruent melting intermediate phase and draw the phase diagram illustrating it?

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 castiron.

5 Explain the following:
(a) Flame hardening.
(b) Induction hardening.

6 What is a brass? Explain red brasses.

7 What is ceramic? Explain crystalline ceramics.

8 Define composite and explain matrix phase & dispersed phase.

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