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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)

II B.Tech I Semester Supplementary Examinations June/July 2014
Mathematics-II
(Common to CE & ME)

Time: 3 hours   Max Marks: 70

Answer any FIVE Questions from the following
All questions carry equal marks (14 Marks each)
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1. a) Find the eigen values and the corresponding eigen vectors of the matrix   10M
$$A = \begin{bmatrix} 0 & 0 & -2 \\ 1 & 2 & 3 \\ 1 & 0 & 3 \end{bmatrix}.$$ Is A diagonalizable.

   b) Prove that a matrix A is singular iff at least one of the Eigen value of A is 0.   4M

2. a) Find the Fourier series expansion for   7M
$$f(x) = -\pi, \ -\pi < x < 0$$
$$= x, \ 0 < x < \pi.$$

   b) Expand the function $f(x) = x \sin x$ as a Fourier series in the $-\pi \le x \le \pi$.   7M

3. a) Form the partial differential equation by eliminating the arbitrary function from   7M
$F(xyz, x + y + z) = 0$.

   b) Solve: $x^2 \dfrac{\partial z}{\partial x} + y^2 \dfrac{\partial z}{\partial y} = 0$ by the method of separation of variables   7M

4. a) Using Newton's backward interpolation formula, estimate the value $f(42)$ from the following data: 7M

x:	20	25	30	35	40	45
$f(x)$:	354	332	291	260	231	204

   b) Find by Newton Raphson method, a root of the equation $x^3 - 3x + 1 = 0$ correct to 3 decimal places.   7M

5. a) Evaluate $\displaystyle\int_4^{5.2} \log x \, dx$ using simpson's 1/3rd rule.   7M

   b) Find the value of $\cos(1.747)$ using the values given in the table below   7M

x:	1.70	1.74	1.78	1.82	1.86
$\sin x$:	0.9916	0.9857	0.9781	0.9691	0.9584

6. a) Use Runge – Kutta method of order 4, find y for x=0.1, 0.2, 0.3 given that   7M
$$\frac{dy}{dx} = xy + y^2, \ y(0) = 1 \ .$$

   b) Given $\dfrac{dy}{dx} = \dfrac{y - x}{y + x}$ with initial condition y=1 at x=0. Find y for x=0.1 by Euler's method.   7M

7. a) Derive the Cauchy–Riemann equations in polar form. Hence deduce that   7M
$$\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \frac{\partial u}{\partial r} + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0 .$$

   b) Determine the analytic function $f(z) = u + iv$, if $u - v = \dfrac{\cos x + \sin x - e^{-y}}{2(\cos x - \cosh y)}$ and $f(\dfrac{\pi}{2}) = 0$.   7M

8. a) If $\phi(a) = \displaystyle\oint_C \dfrac{3z^2 + 7z + 1}{z - a} dz$, where C is the circle $x^2 + y^2 = 4$, find the values of   7M
   i) $\phi(3)$ ii) $\phi'(1 - i)$ iii) $\phi''(1 - i)$.

   b) Expand $f(z) = \dfrac{1}{(z - 1)(z - 2)}$ in the region i) $|z| < 1$ ii) $1 < |z| < 2$ iii) $|z| > 2$.   7M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET

(AUTONOMOUS)

II B.Tech I Semester Supplementary Examinations June/July 2014

Mechanics of Solids

(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE Questions from the following
All questions carry equal marks (14 Marks each)

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1. a) Derive the relationship between elastic modules E, N and K.   7M

    b) Explain the types of stresses and strains   7M

2. A cantilever beam of length 2 m carries a uniformly distributed load of 1 kN/m run   14M
    over a length of 1.5 m from the free end. Draw the shear force and bending moment
    diagrams for the cantilever.

3. State the assumptions in theory of simple bending and derive the equation   14M
    $M/I = f/y = E/R$

4. A timber beam of rectangular section is simply supported at the ends and carries a   14M
    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 derivation of shear stress produced in a circular   14M
    shaft subjected to torsion and derive maximum torque transmitted by a circular solid
    shaft.

6. A beam of length 6m is simply supported at its ends and carries two point loads of   14M
    48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support.
    Find deflection under each load, maximum deflection and the point at which
    maximum deflection occurs. Given E=2x10^5 N/mm2 and I=85x10^6 mm^4. Use
    Macaulay's method.

7. A solid round bar of 60 mm diameter and 2.5 m long is used as a strut. Find the safe   14M
    compressive load for the strut using Euler's formula if (a) both ends are hinged (b)
    both ends are fixed. Take E=2 x 10^5 N/mm^2 and factor of safety as 3.

8. a) Write short notes on compound cylinders.   4M

    b) Derive Lame's equation for a thick cylindrical shell.   10M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations June/July 2014
Metallurgy & Material Science
(Mechanical Engineering)

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

Answer any FIVE Questions from the following
All questions carry equal marks (14 Marks each)

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1. a) Define crystal, space lattice, unit cell and atomic packing factor.   6M

    b) Calculate the number of atoms in the unit cell of FCC structure and calculate the   8M
        atomic packing factor of FCC structure.

2. a) With neat sketch explain substitutional solid solutions and interstitial solid solutions. 6M

    b) Explain Hume-Rothary rules for the formation of substitutional solid solutions.   8M

3.   Explain the following with two examples:

        a) Eutectic system   7M

        b) Peritectic system   7M

4.   Draw neatly the micro structure and explain:

        a) White cast iron   7M

        b) Spheroidal cast iron   7M

5. a) Define heat treatment and heat treatment cycle.   4M

    b) Explain with diagrams the various steps involved in the construction of TTT   10M
        diagram.

6.   Differentiate between brasses and bronzes and explain the following: 5M

        a) Γ brasses   3M

        b) $(\Gamma + S)$ brasses   3M

        c) Tin bronzes   3M

7.   What are various types of composites and explain dispersion reinforced composites,   14M
        fibre reinforced composites and cermets?

8. a) Explain the difference between Iron and Steel.   3M

    b) With neat sketch and reactions explain the acid bessemer process for steel making.   11M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations June/July 2014
Thermodynamics
(Mechanical Engineering)

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

Answer any FIVE Questions from the following
All questions carry equal marks (14 Marks each)
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1. a) Explain homogeneous and heterogeneous systems giving suitable examples of each. 04M

   b) A pump discharges a liquid into a drum at the rate of $0.032 m^3/s$. the drum, 1.50 m in diameter and 4.20 m in length, can hold 3000 kg of the liquid. Find the density of the liquid and the mass flow rate of the liquid handelled by pump. 10M

2. a) Explain the zeroth law of thermodynamics. 04M

   b) A new absolute temperature scale is proposed. On this scale the ice point of water is $150^0 S$ and the steam point is $300^0 S$. Determine the temperature in $^0 C$ that corresponds to $100 ^0 S$ and $400^0 S$ respectively. What is the ratio of the size of $^0 S$ to the size of $^0 S$ to the Kelvin? 10M

3. a) Establish the equivalence of Kelvin-Planck statement and Clausius statement. 04M

   b) Air of mass 0.5 kg as an ideal gas executes a Carnot Cycle having a thermal efficiency of 50 %. The heat transfer to the air during the isothermal expansion is 40kJ. At the beginning of isothermal expansion the pressure is 7 bar and the volume is $0.12 m^3$. Determine 10M

   (a) The maximum and minimum temperatures for the cycle,

   (b) The volume at the end of isothermal expansion,

   (c) The work and heat transfer for each of the four processes.

4. a) Give the criteria of reversibility, irreversibility, and impossibility of a thermodynamic cycle. 06M

   b) How is the entropy change of a reversible process estimated? Will it be different for an irreversible process between the same end states? 08M

5. a) What is critical state? Explain the terms critical pressure, critical temperature and critical volume of water. 08M

   b) Why cannot a throttling calorimeter measure the quality if the steam is very wet? How is the quality measured then? 06M

6. a) What are the fundamental property of gases with respect to product pv? 06M

   b) An ideal gas at temperature T_1 is heated at constant pressure to T_2 and then expanded reversibly, according to the law PV^n = Constant, until the temperature is once again T_1. What is the required value of n, if the change of entropy during the separate processes are equal? 08M

7. a) Two tanks are connected by a valve. One tank contains 2kg of CO_2 gas at $77^o C$ and 0.2 Bar. The other tank holds 8kg of the same gas at $27^o C$ and 1.2 Bar. The valve is opened and gases are allowed to mix while receiving energy by heat transfer from the surroundings. The final equilibrium temperature is 42° C. Determine the final equilibrium pressure and the heat transfer for the process. 10M

   b) Show that for an ideal gas the internal energy depends only on its temperature. 04M

8. a) Explain the mixed or duel cycle. 04M

   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 – 10M

   a. The compressor and turbine work per kg of air and

   b. The cycle efficiency

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations June/July 2014
Electrical Engineering and Electronics Engineering
(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 (14 Marks each)

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PART-A

1. a) State and Explain Kirchhoff's Laws   6M

   b) Consider that three capacitors having capacitances 5, 10, 12 microfarads are   8M
   connected in series across 600V dc main. Determine

        i. Equivalent capacitance of the combinations.

        ii. Charge on each capacitor

        iii. Potential across each capacitor

2. a) Explain in detail the principle of operation of a DC motor.   7M

   b) Derive the expression for DC Generator E.M.F Equation   7M

3. a) Explain the principle of operation of single phase Transformer   7M

   b) Derive the Expression for E.M.F equation of a Transformer   7M

4. a) Explain the working Principle of Single Phase Induction Motor   7M

   b) Comparison between Squirrel cage and Slip ring Induction Motor   7M

PART-B

5. a) Draw the circuit diagram of a Half Wave Rectifier. Explain its working   8M

   b) Draw the V-I Characteristics of P-N Junction Diode   6M

6. a) Draw the typical CB input & output characteristics curves for on n-p-n   10M
   transistor

   b) How transistor is used as an Amplifier   4M

7. Briefly explain about Induction Heating and Dielectric Heating   14M

8. Draw and explain working principle of CRT and write its applications   14M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations June/July 2014
Machine Drawing
(Mechanical Engineering)

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

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Section-I

*Answer any two of the following*   *2X4=8M*

1. Sketch the conventional representation of the following   4M

   (a) splined shaft

   (b) Compression spring.

2. Sketch the single headed feather key in two views, as fitted in a position between a   4M
   shaft and the mounting. Choose the shaft diameter as 30 mm and the hub diameter of
   the mounting as 60 mm.

3. Sketch any one type of cap screw of 25 mm diameter.   4M

4. Sketch the ACME thread profile for a nominal diameter of 25 mm and pitch 3 mm.   4M

Section-II

Answer any two of the following   *2X10=20M*

5. Sketch the required views indicating the proportions of a solid flange coupling used in   10M
   marine engines to connect two shafts, each of diameter 60 mm.

6. Draw   10M

   (a) sectional view from the front and

   (b) view from the top of a knuckle joint indicating proportions to connect two shafts
   each of diameter 40 mm.

7. Draw   10M

   (a) sectional view from the front and

   (b) view from the above of the double riveted, double strap, zig-zag butt joint to join
   plates of thickness 10 mm.

8. Sketch the necessary views of a bushed journal bearing for supporting a shaft of   10M
   diameter 50 mm.

Section-III

Answer the following question   *1X42=42M*

9. The details of an air cock is shown in Fig. Assemble the parts and draw   42M

   (i) Half sectional view from the front,

   (ii) View from the right and

   (iii) The view from above.
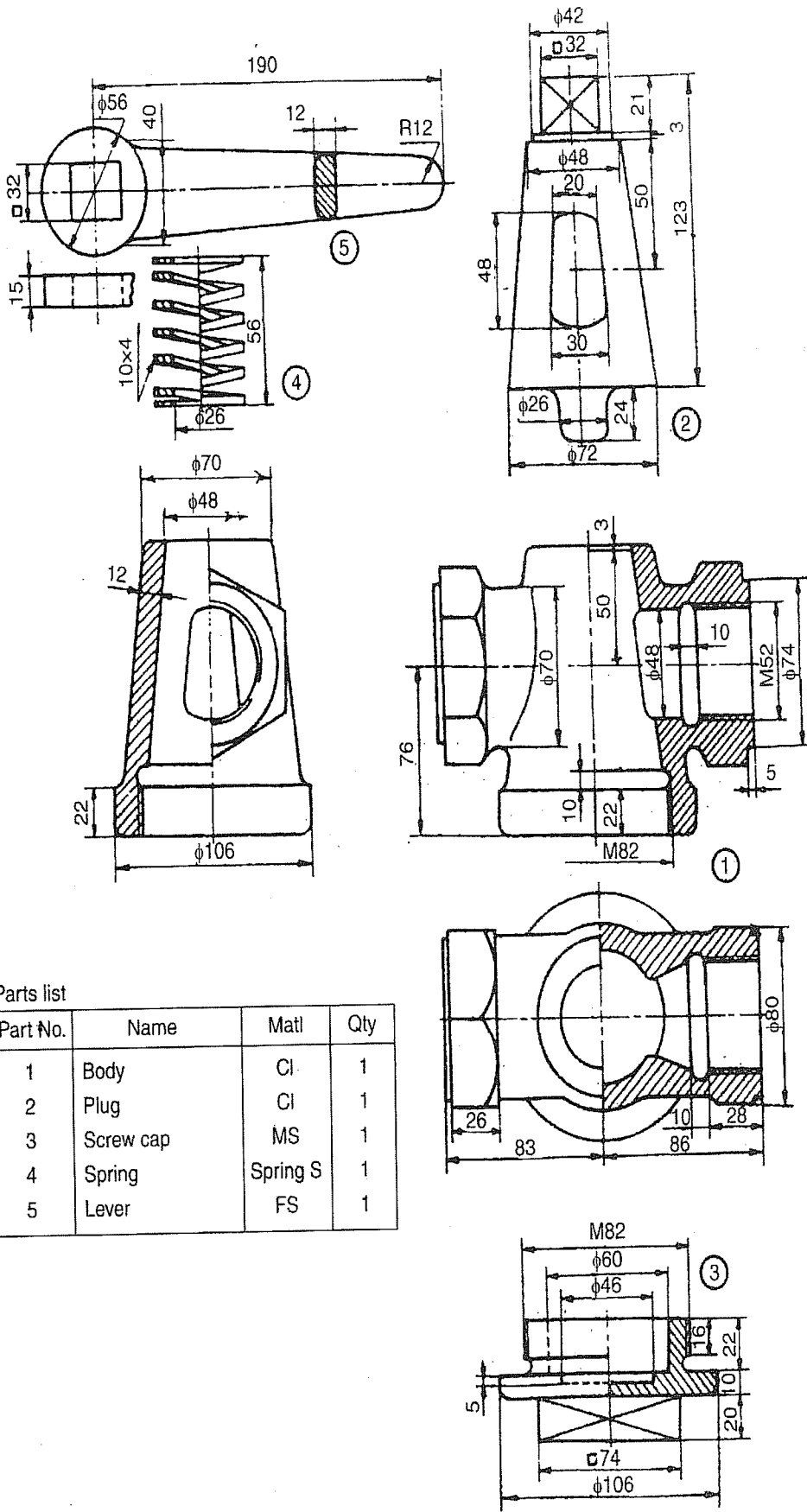
Parts list

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

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