Code :9A03302 **R9**

**II B.Tech I Semester(R09) Supplementary Examinations, May 2011**
**THERMODYNAMICS**
**(Aeronautical Engineering, Mechanical Engineering)**

**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 system receives 200 Kj of work at constant volume process and rejects 220 Kj of heat at constant pressure and 40 Kj of work is done on the system. The system is brought to its original state by an adiabatic process. Calculate the adiabatic work. If the initial internal energy is 240 Kj, then calculate the value of internal energy at all points.
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) Explain with a neat diagram p-v-t surface.
   (b) Find the enthalpy and entropy of steam when the pressure is 2 MPa and the specific volume is 0.09 $m^3$/kg
5. Derive the work transfer equations for various Quasi-static processes.
6. A perfect gas mixture consists of 4 kg of hydrogen and 6 kg of carbondioxide at a pressure of 4 bar and a temperature of $25^0$C. Calculate $C_p$ and $C_v$ of the mixture. If the mixture is heated at constant volume to $50^0$C,find the change in the internal energy, enthalpy and entropy of the mixture.
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) 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 $\gamma = 1.4$

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**Code :9A03303** **R9**

**II B.Tech I Semester(R09) Supplementary Examinations, May 2011**
**MACHINE DRAWING**
**(Mechanical Engineering)**

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

**Answer ALL questions**
**All questions should be on the drawing sheet only**
**Answers on the drawing sheet only will be valued**

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1. Answer any two: [02 x 04=08 Marks]
   (a) Sketch a metric 'V' thread.
   (b) Sketch Woodruff key
   (c) Flat rivet head.

2. Answer any two: [02 x 10=20 Marks]
   (a) Double riveted zig zag, riveted joint with single strap to connect two 10 mm plates.
   (b) Sleeve and Cotter joint to connect two rods of 25mm diameter
   (c) Muff coupling to connect two shafts of 40mm each.

3. Compulsory Question: [01 x 42=42 Marks]
   The part drawings of an ECCENTRIC are enclosed in the sketch. Assumable the parts and draw.
   (a) Half sectional front view with top half in section and
   (b) Left side view.

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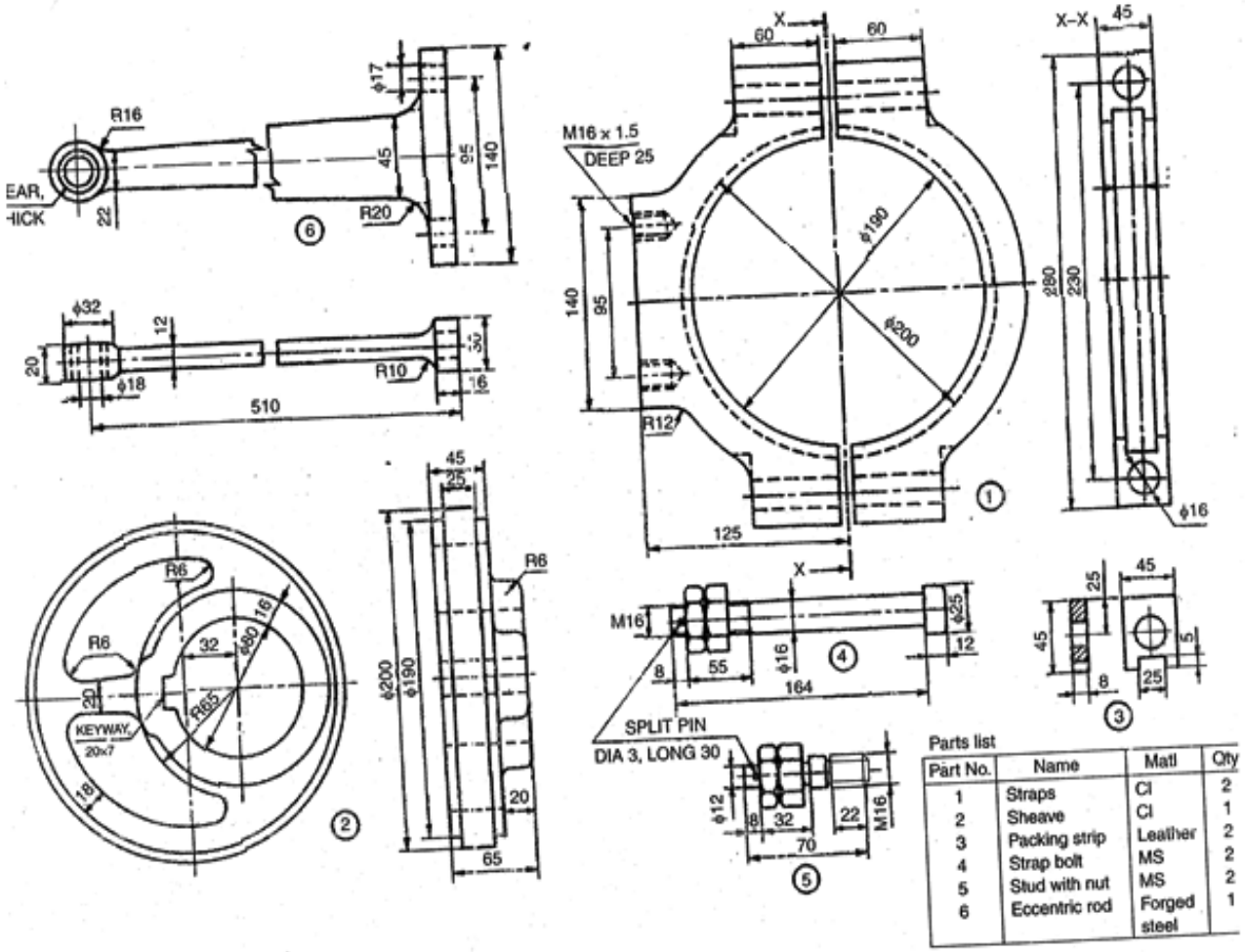


Parts list

| Part No. | Name | Matl | Qty |
|---|---|---|---|
| 1 | Straps | CI | 2 |
| 2 | Sheave | CI | 1 |
| 3 | Packing strip | Leather | 2 |
| 4 | Strap bolt | MS | 2 |
| 5 | Stud with nut | MS | 2 |
| 6 | Eccentric rod | Forged steel | 1 |

Details of an eccentric

Code :9ABS301 **R9**

**II B.Tech I Semester(R09) Supplementary Examinations, May 2011**
**MATHEMATICS-II**
**(Aeronautical Engineering, Biotechnology, Civil Engineering, Mechanical Engineering)**
**Time: 3 hours** **Max Marks: 70**

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

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1. (a) Find whether the following equations are consistent, it so solve them.
$X + Y + 2Z = 4 : 2X - Y + 3Z = 9 : 3X - Y - Z = 2$

   (b) Show that the matrix statistics its characteristic equation. Hence find $A^{-1}$.
$$\begin{bmatrix} 1 & -2 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$$

2. Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to canonical form by an orthogonal transformation and hence find its rank, index, signature and nature.

3. (a) Find the Fourier series for $f(x) = e^{-x} in 0 < x < 2\pi$

   (b) Find the half-range sinc series for the function $f(x) = x - x^2, 0 < x < 1$.

4. (a) Show that the Fourier transforms of $e^{\frac{-x^2}{2}}$ is $\sqrt{2}\pi e^{\frac{-s^2}{2}}$.

   (b) Find the Fourier sine and cosine transform of $f(x) = 2e^{-5x} + 5e^{-2x}$.

5. (a) Form the partial differential equation by eliminating the arbitrary function from $f(xy + z^2, x + y + z) = 0$.

   (b) Find the three possible solutions of the wave equation $\frac{\partial^2 y}{\partial t^2} = \frac{a^2 \partial^2 y}{\partial x^2}$ by the method of separation of variables.

6. (a) Find a real root of the equation $xe^x - \cos x = 0$ using Newton's -Raphson method.

   (b) Using Newton's forward interpolation formula, and the given table of values find f(1.4).

| X:1.1 | 1.3 | 1.5 | 1.7 | 1.9 |
|---|---|---|---|---|
| F(x):0.21 | 0.69 | 1.25 | 1.89 | 2.61 |

7. (a) Fit a straight line to the following data.

| X | 0 | 5 | 10 | 15 | 20 | 25 |
|---|---|---|---|---|---|---|
| Y | 12 | 15 | 17 | 22 | 24 | 30 |

   (b) Given the following table of values of x and y

| X:1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
|---|---|---|---|---|---|---|
| Y:7.989 | 8.403 | 8.781 | 9.129 | 9.451 | 9.750 | 10.031 |

   Find $\frac{dy}{dx}$ *and* $\frac{d^2y}{dx^2}$ *at* $x = 1.1$

8. Use Runge-Kutta method to evaluate y(0,1) and y(0.2) given that $\frac{dy}{dx} = x + y, y(0) = 1$.

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Code :9A01301 **R9**

**II B.Tech I Semester(R09) Supplementary Examinations, May 2011**
**MECHANICS OF SOLIDS**
**(Aeronautical Engineering, Mechanical Engineering)**

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

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

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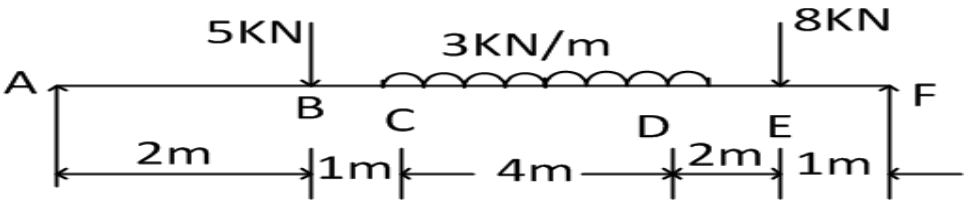
1. (a) Derive the relationship between elastic modules E, N and K.
   (b) The modulus of rigidity for a material is $0.5 \times 10^5 N/mm^2$. A 12 mm diameter rod of the material was subjected to an axial pull of 14 KN and the change in diameter was observed to be $3.6 \times 10^{-3} mm$. Calculate Poisson's ratio and the modulus of elasticity.

2. Draw the SFD and BMD for the simply supported beam shown in figure.




3. A timber beam of rectangular section is to support a load of 30KN 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 60 N/mm$^2$, find the dimensions of the cross section. How would you modify the cross section of the beam if it were a concentrated load placed at the centre with the same ratio of breadth to depth?

4. A beam of triangular cross-section with base b and height h, is used with the base horizontal. Calculate the intensity of max shear stress and plot the variation od shear stress intensity over the section.

5. (a) Explain the types of leaf springs with sketches.
   (b) A close-coiled helical compression spring is made of 10 mm steel wire closely coiled to a mean diameter of 100 mm with 20 coils. A weight of 100N is dropped on to the spring. If the maximum instantaneous compression is 60 mm, calculate the height of the drop. Take $N = 0.85 \times 10^5 N/mm^2$.

6. (a) Derive the differential equation for the elastic line of a beam.
   (b) Write short notes on moment area method.

7. (a) Derive the formula for longitudinal and circumferential stresses.
   (b) Write short notes on riveted boilers shells.

8. A compound cylinder formed by shrinking one tube onto another is subjected to an internal pressure of 50N/mm$^2$. Before the fluid is admitted the internal and external diameter of the compound cylinder are 100mm and 180mm and the diameter at the junction is 150mm. If after shrinking on the radial pressure at the common surface is 8N/mm$^2$. Calculate the final stresses setup by the section.

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Code :9A02301 **R9**

**II B.Tech I Semester(R09) Supplementary Examinations, May 2011**
**ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING**
**(Common to Mechanical Engineering, Aeronautical Engineering)**

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

**(Minimum of TWO questions from each part should be chosen for answering FIVE questions)**

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## PART-A

1. (a) State and explain Ohm's law
   (b) Write short note on star-delta transformation If $R_{ab}$, $R_{bc}$ and $R_{ca}$ are connected in delta, derive the expression for equivalent star connection.
2. (a) Explain the working of 3- point starter with neat diagram.
   (b) A 4-pole wave connected DC generator having 60 slots on its armature with 6 conductors per slot, run at 750 rpm and generate an open circuit voltage of 230V. Find the useful flux per pole.
3. (a) Explain the principle of operation of single phase transformer.
   (b) A single phase transformer has 500 primary and 1000 secondary turn. The net cross sectional area of the core is $50cm^2$. If the primary winding is connected to a 50 HZ supply at 400v. Calculate the peak value of the flux density in the core and voltage induced in the secondary winding.
4. Define the regulation of a alternator. Explain how will you determine the regulation of an alternator by using synchronous impedance method with neat circuit diagram.

## PART-B

5. (a) Draw the V-I characteristics of p-n diode and explain.
   (b) Draw the circuit diagram of a fall wave rectifier having two diodes & explain its operations.
6. (a) Explain why CE configuaration is commonly used in amplifier circuits.
   (b) Draw the V-I characteristics of SCR and account for the shape of the characteristics.
7. (a) Give basic setup and explain the principle of inducting heating.
   (b) Draw and explain piezo electric generator circuit using Hartley oscillator for generation of ultrasonic waves.
8. (a) Derive the expression for the electromagnetic deflection sensitivity in case of the CRT.
   (b) Derive the expression for acceleration, velocity & displacement of a charged particle placed in an electric field E.

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Code :9A03301 **R9**

**II B.Tech I Semester(R09) Supplementary Examinations, May 2011**
**MATERIALS SCIENCE & ENGINEERING**
**(Aeronautical Engineering, Mechanical Engineering)**

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

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

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1. Discuss the effect of grain boundaries on the properties of alloys.
2. Discuss different types of solid solutions with examples.
3. With a neat figure describe Fe-$Fe_3C$ diagram.
4. Classify and describe the properties of steel.
5. What are TTT diagrams? Explain their use in metallurgy.
6. Explain the structure and properties of titanium.
7. What are crystalline ceramics? How are they different from cermets?
8. Classify composites. Explain and give an example for each classification.

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