Hall Ticket Number :										

Code : 4GC31 **R-14**

II B.Tech. I Semester Supplementary Examinations May/June 2016

Mathematics-II

(Common to CE & ME)

Max. Marks: 70 **Time: 03 Hours**

Answer *all five* units by choosing one question from each unit (5 x 14 = 70Marks)

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UNIT-I

1. a) By reducing the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$ in to normal form and find its rank.

   b) Using Cayley-Hamilton Theorm find A^4,where $A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$

OR

2. a) Find the values of a and b for which the equations x + y + z = 3, x +2y +2z = 6, x + ay +3z = b have **i)** no solution **ii)** a unique solution **iii)** infinite number of solutions.

   b) Eigen values & Eigen Vectors of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

UNIT-II

3. a) Find the real root of the equation 2x – 3 sin x – 5 = 0, using Regula falsi Method.

   b) Find f(22) for the following data by Newton's forward Interpolation formula.

x	20	25	30	35	40	45
y	354	332	291	260	231	204

OR

4. a) Find the negative root of the equation $x^3 - 21x + 3500 = 0$ by Newton's Raphson method.

   b) Evaluate $\int_0^1 e^{-x}\,dx$ using Simpsons 1/3rd rule.

UNIT-III

5. a) Use Picard's method to approximate the value of y when $x = 0.4$, given that $\frac{dy}{dx} = x^2 + y^2, y(0) = 0$.

   b) Use Runge-Kutta method of 4th order to find y(0.2), given that $10\frac{dy}{dx} = x^2 + y^2, y(0) = 1$

OR

6. Find $y(0.2), y(0.4), y(0.6)$ using Runge- kutta 2nd order method and then find $y(0.8)$ by Milne's method if $\frac{dy}{dx} = 1 + y^2, y(0) = 0$.

UNIT-IV

7. a) Find the half-range sine series for $f(x) = x(\pi - x)$ in $0 < x < \pi$. Deduce that $\frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \frac{1}{7^3} + \cdots = \frac{\pi^3}{32}$.

   b) Use the separation of variables technique to solve $3u_x + 2u_y = 0$ with $u(x,0) = 4e^{-x}$

OR

8. a) Given $f(x) = \begin{cases} -x + 1, -\pi \le x \le 0, \\ x + 1\ , \ 0 \le x \le \pi. \end{cases}$ Is the function even or odd? Find the Fourier series for $f(x)$ and deduce the value of $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$

   b) Obtain the partial differential equation by eliminating the arbitrary functions from $z = yf(x) + xg(y)$.

UNIT-V

9. a) Find the regular function whose imaginary part is $\frac{x-y}{x^2+y^2}$

   b) Evaluate, using Cauchy's integral formula $\int_C \frac{\log z}{(z-1)^3} dz$, where c is $|z-1| = \frac{1}{2}$

OR

10. a) Find whether f(z) = $\frac{x-iy}{x^2+y^2}$ is analytic or not.

    b) Use Cauchy's integral formula to evaluate $\int_c \frac{e^{-z}}{(z+1)} dz$, where C is the circle $|z| = 2$.

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Hall Ticket Number :										

Code : 4G236

R-14

II B.Tech. I Semester Supplementary Examinations May/June 2016

Electrical Engineering and Electronics Engineering

(Common to ME, CSE & IT)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70Marks)

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UNIT-I

1. a) Three resistances of R ohms are connected in delta. Transform it into an equivalent star with resistances R_1, R_2 and R_3. 7M

   b) Define the terms active elements, bilateral elements, linear elements and passive elements with examples. 7M

OR

2. a) Derive the expression for equivalent inductance of two parallel connected inductors. 7M

   b) Three capacitors of 2 mF, 5 mF and 10 mF are connected in series. Find the equivalent capacitance. 7M

UNIT-II

3. a) Derive E.M.F. equation of a d.c generator. 7M

   b) Explain the operation of three point starter. 7M

OR

4. a) Derive the condition for maximum efficiency of dc motor. 7M

   b) Draw the equivalent circuits and write voltage current relations for separately excited dc motor and dc shunt motor. 7M

UNIT-III

5. a) Explain the principle of operation of single phase transformer. 7M

   b) Explain how equivalent circuit parameters are determined for open circuit and short circuit tests. 7M

OR

6. a) Explain the principle of operation of a three phase induction motor with relevant diagrams. 7M

   b) Explain the operation of alternator and derive its emf equation. 7M

UNIT-IV

7. a) Explain the working of full wave rectifier with necessary diagrams. 9M

   b) What are the applications of diode rectifiers? 5M

OR

8. a) What is feedback amplifier? Explain the operation of feedback amplifier. 7M

   b) Derive the expressions for voltage gain, current gain, output impedance and input impedance of a CE amplifier. 7M

UNIT-V

9. a) What are the applications of induction heating? 5M

   b) Explain about induction heating with necessary diagrams. 9M

OR

10. a) List the applications of dielectric heating. 5M

    b) Explain the working of CRO with relevant diagrams. 9M

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Hall Ticket Number :										

R-14

Code : 4G531

II B.Tech. I Semester Supplementary Examinations May/June 2016

Mechanics of Solids

(Mechanical Engineering)

Max. Marks: 70 **Time: 3 Hours**

Answer *all five* units by choosing one question from each unit (5 x 14 = 70Marks)

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UNIT-I

1. a) Define three elastic constants. 4M

   b) A steel flat thickness 10 mm tapers uniformly from 60 mm at one end to 40 mm at the other end in a length of 600 mm. If the bar is subjected to a load of 60 N, find its extension. Take E=2 $X10^5$ MPa. What is the percentage error if the average area is used for calculating extension? 10M

OR

2. a) Define
   a) Factor of safety
   b) Lateral strain
   c) Poisson's ratio 4M

   b) A specimen of steel 25 mm diameter with a gauge length of 200 mm is tested to destruction. It has an extension of 0.16 mm under a load of 80 kN and the load at elastic limit is 160 kN. The maximum load is 180 kN.

   The total extension at fracture is 56 mm and diameter at neck is 18mm. Find

   i) The stress at elastic limit
   ii) Young's Modulus
   iii) Percentage elongation
   iv) Percentage reduction in area
   iv) Ultimate tensile stress 10M

UNIT-II

3. A simply supported beam AB of 6 m span is carrying a uniformly distributed load of 5 kN/m over a length of 3 m from left end and a point load of 80 kN at a distance of 1.5 m from right end. Draw the shear force and Bending Moment diagram for the beam and also calculate maximum bending moment. 14M

OR

4. A girder 6 m long rests on two supports with equal overhangs on either side and carries a uniformly distributed load of 30 kN per metre run over the entire length. Calculate the overhangs if the maximum bending moment, positive or negative, is to be as small as possible. Draw SF and BM diagrams for the double overhang beam. 14M

UNIT-III

5. a) Derive the bending equation? 7M

   b) A rectangular beam, simply supported over a span of 4 m, is carrying uniformly distributed load of 50 kN/m. Find the dimensions of the beam, if depth of the beam section is 2.5 times its width. Take maximum bending stress in the beam section as 60 MPa. 7M

OR

6. The unsymmetrical I section has the dimensions of top flange 60 X 20, Bottom flange 160 X 20 and web of 200 X 20.If the sheer force acting on the section is 40 kN. Draw the shear stress variation diagram across the depth. 14M

UNIT-IV

7. A simply supported beam of span L is subjected to equal loads w/2 at each of 1/3 rd span points. Find the expressions for deflection under loads and at mid span. 14M

OR

8. Determine the diameter of solid shaft which will transmit 440 kW at 280 rpm. The angle of twist must not exceed one degree per metre length and the maximum torsional shear stress is to be limited to 40 N/mm^2.Assume G=84 kN/mm^2. 14M

UNIT-V

9. a) A spherical shell of 1 m diameter is subjected to a pressure of 2.4 MPa. What is the stress induced in the vessel plate. If its thickness is 15 mm? 4M

   b) A boiler shell of 2 m diameter is made up of mild steel plates of 20 mm thick. The efficiency of the longitudinal and circumferential joints is 70% and 60% respectively. Determine the safe pressure in the boiler, if the permissible tensile stress in the plate section through the rivets is 100 MPa. Also determine the circumferential stress in the plate and longitudinal stress through the rivets. 10M

OR

10. a) Define the terms ‘column’ and ‘strut’. Distinguish between long column and short column. 4M

    b) A steel rod 5 m long and of 40 mm diameter is used as a column, with one end fixed and the other free. Determine the crippling load by Euler’s formula. Take E as 200 GPa. 10M

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Hall Ticket Number :										

Code : 4G532

R-14

II B.Tech. I Semester Supplementary Examinations May/June 2016

Metallurgy & Material Science

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70Marks)

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UNIT-I

1. How do you determine the grain size? And explain any two methods of determination of grain size.

OR

2. What is a solid solution? Discuss the similarities and differences between substitutional and interstitial solid solutions.

UNIT-II

3. What are peritectic reactions? And explain the equilibrium diagrams with neat sketch.

OR

4. Explain with neat sketch the binary phase diagrams of
   i) Cu-Ni
   ii) Al-Cu

UNIT-III

5. Give the classification of steels and explain the properties and uses of spheroidal cast iron

OR

6. Explain the structure and properties of Tool and die steels and its applications.

UNIT-IV

7. Describe the steps in construction of TTT diagram with an example.

OR

8. Describe briefly the following processes of surface hardening.
   a) Flame hardening.
   b) Induction hardening.

UNIT-V

9. What is reinforced composite? Explain the preparation of any one reinforced composite and also list its applications in the industry.

OR

10. a) Explain the Crucible process of steel making.
    b) What are the advantages and disadvantages of open hearth process?

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Hall Ticket Number :										

Code: 4G533 **R-14**

II B. Tech. I-Semester Supplementary Examinations May/June 2016

Basic Thermodynamics

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70Marks)

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UNIT-I

1. a) What is steady flow process? Derive an expression for SFEE. 6M

   b) A piston-cylinder arrangement is containing a fluid at 10 bar, the initial volume being 0.05m^3. Find the work done by the fluid when it expands reversibly according to the law pv^3 = constant to final volume of 0.06m^3. 8M

OR

2. a) Define concept of equality of temperature, zeroth law of thermodynamics and PMM1 6M

   b) During one cycle the working fluid in an engine engages in two work interactions: 15 kJ to the fluid and 44 kJ from the fluid, and three heat interactions: two of which are known: 75 kJ to the fluid and 40 kJ from the fluid. Evaluate the magnitude and direction of the third heat transfer. 8M

UNIT-II

3. a) Derive an expression for Clausius inequality and explain its utility. 6M

   b) A heat engine receives half of its heat supply at 1000 K and half at 500K while rejecting at a sink 300K. What is the maximum thermal efficiency of the heat engine? 8M

OR

4. a) Describe the processes of Carnot Cycle using PV and TS diagrams and derive an expression for its efficiency. 6M

   b) One kg of ice at - 5^0C is exposed to the atmosphere which is at 25^0C. The ice melts and comes into thermal equilibrium. Find the entropy increase of the Universe. 8M

UNIT-III

5. a) What is a pure substance? Draw and explain P-T diagram for pure substance 6M

   b) Four kg of steam expands adiabatically from 16 bar and 250^0C to 0.6 bar in a steam turbine such that the steam is dry and saturated at the end of the expansion. Calculate the work done by the steam and the work lost due to the irreversibility. 8M

OR

6. a) Describe the Mollier diagram and explain its uses. 6M

   b) Steam at a pressure of 5 bar and 0.8 dry expands in a cylinder according to the law $pv^{1.35}$= constant to 2 bar. Find the interchange of heat between the steam and the cylinder per kg of steam and work done. 8M

UNIT-IV

7. a) Explain Vander wall's equation of state and derive the constants for the equation 6M

   b) The following volumetric composition relate to a mixture of gases: - N_2 = 81%, CO_2=11%, O_2 = 6%, CO = 2% Determine **i)** the gravimetric composition. **ii)** Molecular weight and **iii**) Universal gas constant R for the mixture. 8M

OR

8. a) Explain what is Gravimetric and volumetric Analysis. 6M

   b) A tank of volume $2m^3$ containing O_2 at 600Kpa and 300K is connected to another tank of volume 3m containing CO_2 at 150kPa and 290K .The gases mix adiabatic ally and come to an equilibrium state. Determine the final temperature and pressure of the mixture and the entropy change for the system. 8M

UNIT-V

9. a) Explain the four processes of the Stirling cycle with PV and TS diagrams? 6M

   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? 8M

OR

10. a) What is an Air standard cycle? What are the assumptions for Air standard cycles? 6M

    b) In the constant volume cycle the temperature at the beginning and end of the compression are 43^0C and 323^0C respectively. Calculate the **i)** air standard efficiency and **ii**) the compression ratio. Assume γ = 1.4 for air. 8M

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Hall Ticket Number :										

Code : 4G534

R-14

II B.Tech. I Semester Supplementary Examinations May/June 2016

Machine Drawing

(Mechanical Engineering)

Max. Marks: 70 Time: 4 Hours

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Section-I **2 X 4 = 8M**

1. Draw the conventional representation of the following
   a) Steel
   b) Concrete 4M

OR

2. Draw the conventional representation of the following
   a) Internal Threaded Screw
   b) Holes on circular pitch 4M

3. Show with an example the following dimensioning
   a) Dimensioning chamfers
   b) Dimensioning Countersinks 4M

OR

4. Draw the thread profiles with pitch 20mm
   a) British Association (BA) 4M
   b) Knuckle Thread

Section-II

Answer any two of the following **2 X 10 = 20M**

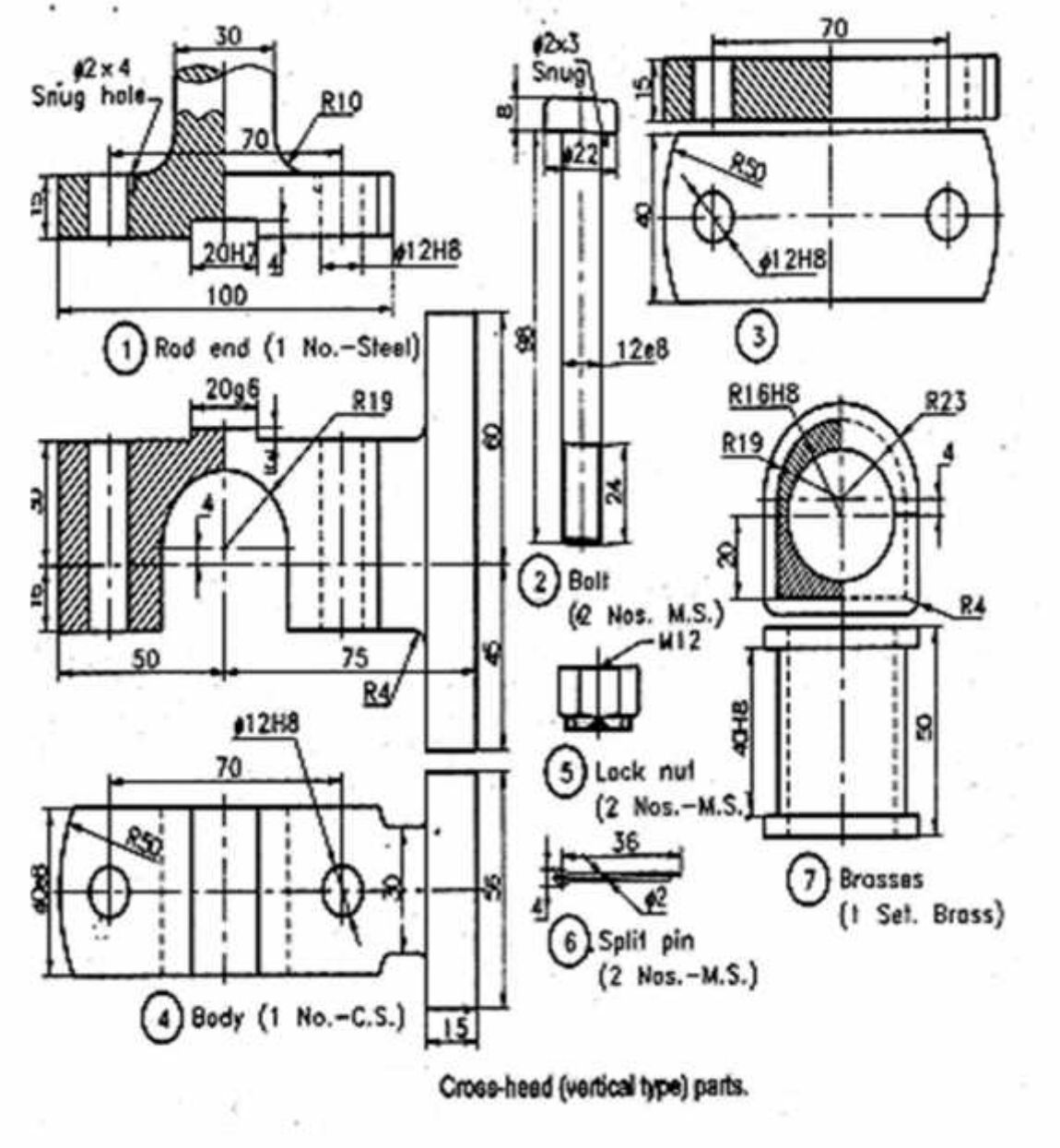
5. Draw sectional front view of a flanged coupling for a shaft of diameter 'D'. 10M

6. Draw the following with the standard proportions
   a) Square nut
   b) Square headed bolt with square neck 10M

7. Draw the sectional front view and top view of the double strap single riveted zig-zag butt joint to join plates of thickness 15mm. 10M

Section-III
Compulsory Question
Assembly Drawing 1x42=42 Marks

8. Details of a cross head are shown in fig. Assemble all the parts and draw sectional front view of the assembled cross head.



Cross-head (vertical type) parts.