Hall Ticket Number :

Code: 4GC31

R-14

II B. Tech. I-Semester Regular Examinations Nov/Dec 2015

Mathematics–II

(Common to CE & ME)

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) Reduce the Matrix $\begin{pmatrix} 5 & 3 & 14 & 4 \\ 0 & 1 & 2 & 1 \\ 1 & -1 & 2 & 0 \end{pmatrix}$ into Echelon form and hence find its Rank.

   b) Find the inverse of the matrix $\begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 0 \end{pmatrix}$ using Cayley- Hamilton theorem

OR

2. a) Determine the values of λ for which the following set of equations may possess non-trivial solution. $3x + y - \lambda z = 0$, $4x - 2y - 3z = 0$, $2\lambda x + 4y + \lambda z = 0$. For each permissible value of λ, determine the general solution.

   b) Find the Eigen values and the corresponding Eigen vectors of the matrix $\begin{pmatrix} -2 & 5 \\ -1 & 4 \end{pmatrix}$

UNIT-II

3. a) Find the real root of the equation $x \tan x + 1 = 0$, using Newton Raphson Method.

   b) The velocity ***v*** of the particle at a distance s from a point on its path is given the following table

s(ft.)	0	10	20	30	40	50	60
v (ft.)	47	58	64	65	61	52	38

Estimate the time taken to travel 60 ft. by using Simpson's 1/3 rule.

OR

4. a) Using Regula falsi method, find the real root of the equation $2x - \log_{10} x - 6 = 0$ correct to three decimal places.

   b) Apply Lagrange's method to find the value of f(x) when x = 10 from the given data.

x	5	6	9	11
f(x)	12	13	14	16

UNIT-III

5. a) Using the Taylor's series method, solve $\frac{dy}{dx} = 2y + 3e^x, y(0) = 0 \; at \; x = 0.1, 0.2.$

   b) Using Runge-Kutta method of 4th order, find $y \; for \; x = 0.2,$ given that $\frac{dy}{dx} = xy + y^2, y(0) = 1.$

OR

6. Using Milne's predictor-corrector method, find $y(0.4)$, given that $\frac{dy}{dx} = 1 + xy, y(0) = 2.$ Find the initial values using Taylor's series method.

UNIT-IV

7. a) Obtain the Fourier series to represent $f(x) = \frac{1}{4}(\pi - x)^2$ in $0 < x < 2\pi$.

   b) Solve the differential equation $4u_x + u_y = 3u \text{ and } u(0,y) = e^{-5y}$, by the method of separation of variables

OR

8. a) Find the half-range cosine series for $f(x) = x(2-x)$ in $0 \leq x \leq 2$. and deduce the value of $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \frac{1}{5^2} - \cdots$

   b) Form the Partial differential equation by eliminating the arbitrary function $\emptyset$ from the relation $\emptyset(x^2 + y^2 + z^2, xyz) = 0$.

UNIT-V

9 a) Show that $f(z) = \frac{xy^2(x+iy)}{x^2+y^4}$, $z \neq 0$ and f(0) = 0 is not analytic at z = 0 although C-R equations are satisfied at the origin.

   b) Use Cauchy's integral formula to evaluate $\oint_c \frac{z+4}{z^2+2z+5} dz$ where c is the circle $|z+1| = 1$.

OR

10. a) Show that the function $u = \frac{1}{2}$ log ($x^2 + y^2$) is harmonic and find its harmonic Conjugate.

   b) Use Cauchy's integral formula to evaluate $\oint_c \frac{(e^z + z\sinh z)}{(z-\pi i)^2} dz$ where c is the circle $|z| = 4$.

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Hall Ticket Number :										

R-14

Code: 4G236

II B. Tech. I-Semester Regular Examinations Nov/Dec 2015

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) State and explain Kirchoff's laws. 6M
   b) A resistance of R ohms is connected in series with a parallel circuit of two resistors of 12 ohms and 24 ohms. The total power dissipated in the circuit is 80 Watts when the applied voltage was 30 V, find the value of R. 8M

OR

2. a) Obtain the equivalent inductance of three parallel connected inductors of value 10 mH. 7M
   b) A circuit consists of two resistors 20 ohm and 30 ohm connected in parallel. They are connected in series with a resistor of 15 ohm. If the current through the 15 ohm resistor is 3 A, find the current in the other resistors and supply voltage 7M

UNIT-II

3. a) A 4 pole d.c generator is running at 1500 rpm, flux is 7 mwb, number of slots is 52, conductors per slot is 20. Calculate the generated voltage. 7M
   b) Derive torque equation of a dc motor. 7M

OR

4. a) Explain the speed control methods used for dc motors. 7M
   b) Write about Swinburne's test on dc machine. 7M

UNIT-III

5. a) Derive the emf equation of single phase transformer and draw its phasor diagram. 7M
   b) Write about various losses in transformer. 7M

OR

6. a) What is voltage regulation? Explain about synchronous impedance method of finding regulation. 7M
   b) Explain torque slip characteristics of a three phase induction motor. 7M

UNIT-IV

7. a) Explain the operation of bridge rectifier with relevant diagrams. 8M
   b) Write the necessary conditions for oscillators. 6M

OR

8. a) Explain the operation of a transistor as an amplifier. 7M
   b) Explain about frequency response of a CE amplifier. 7M

UNIT-V

9. a) What is deflection sensitivity? Explain. 7M
   b) Explain about dielectric heating with relevant diagrams. 7M

OR

10. a) List the applications of CRO. 6M
    b) Write about voltage, current and frequency measurement using CRO. 8M

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Hall Ticket Number :										

R-14

Code: 4G531

II B. Tech. I-Semester Regular Examinations Nov/Dec 2015

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) State clearly Hooke's Law. 2M

   b) A bar of 20 mm diameter is tested in tension. It is observed that when a load of 37.7 kN is applied ,the extension measured over a gauge length of 200 mm is 0.12 mm and contraction in diameter is 0.0036 mm. Find Poisson's ratio and elastic constants E,G,K. 12M

OR

2. a) Define strain energy and Resilience. 2M

   b) A steel bar 20 mm diameter and 1 m long is freely suspended from a roof and is provided with a collar at the other end. If the modulus of elasticity is 2 $X10^5$ and maximum permissible stress is 300 N/mm^2,Find

      i) The maximum load which can fall from a height of 50 mm on the collar

      ii) The maximum height from which a 600N load can fall on the collar. 12M

UNIT-II

3. A simply supported beam of length 7 m and carrying a UDL of 10 kN/m for a distance of 3 m from the left end. Draw the shear force and Bending moment diagrams. Also calculate the maximum bending moment. 14M

OR

4. A beam 6 m long rests on two supports 5 m apart. The right end is overhanging by 1 m. The beam carries a uniformly distributed load of 1.5 kN/m over the entire length of the beam. Draw S.F. and B.M. diagram and find the amount and position of maximum bending moment. 14M

UNIT-III

5. a) State the assumptions made in theory of simple bending? 4M

   b) A circular pipe of external diameter 70 mm and thickness 8 mm is used as a simply supported beam over an effective span 2.5 m. Find the maximum concentrated load that can applied at the center of the span if permissible stress in tube is 150 N/mm^2. 10M

OR

6. An I-sections, with rectangular ends, has the following dimensions:

   Flanges = 150 mm X 20 mm, Web = 300 mm X 10 mm.

   Find the maximum shearing stress developed in the beam for a shear force of 50 kN. 14M

UNIT-IV

7. Derive an expression for max deflections for a simply supported beam subjected to UDL by double integration method. 14M

OR

8. A hollow circular shaft 200 mm external diameter and thickness of metal 25 mm is transmitting power at 200 rpm. The angle of twist over a length of 2 m was found to be 0.5 degrees. Calculate the power transmitted and the maximum shear stress induced in the section. Take modulus of rigidity of material as 84 kN/mm^2. 14M

UNIT-V

9. A thin cylindrical shell, 2m long has 200 mm diameter and thickness of metal 10 mm. It is filled completely with fluid at atmospheric pressure. If an additional 25000 mm^3 fluid is pumped in, find the pressure developed and hoop stress developed. Find also the changes in diameter and length. Take $E=2 X10^5$ N/mm^2 and $\mu=0.3$. 14M

OR

10. A hollow cast from iron whose outside diameter is 200 mm and has a thickness of 20 mm is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankine's formulae using a factor of safety of 2.5.Find the ratio of Euler's to Rankine's loads. Take $E=1X10^5$ N/mm^2 and Rankines constant=1/1600 for both ends pinned case and $f_c=550$ N/mm^2. 14M

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Hall Ticket Number :										

R-14

Code: 4G532

II B. Tech. I-Semester Regular Examinations Nov/Dec 2015

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. List the various types of bonds occurring in a crystal. Discuss the metallic bond and its characteristics

OR

2. a) What is the necessity of alloying?
   b) Write a note on intermediate phases.

UNIT-II

3. Define Eutectic systems. Explain about equilibrium cooling and heating of alloys.

OR

4. What is equilibrium diagram? State its importance and objectives. How is equilibrium diagrams classified?

UNIT-III

5. Explain micro structure, properties and uses of White cast iron

OR

6. Explain the structure and properties of plain carbon steels and its applications.

UNIT-IV

7. a) State the objectives of annealing.
   b) Explain briefly
      i) Full annealing.
      ii) Isothermal annealing

OR

8. a) What is age hardening treatment?
   b) Describe briefly Nitriding surface hardening.

UNIT-V

9. Give the classification of composites and explain any one method of manufacture of composites?

OR

10. Explain the Electric furnace process for steel making with neat sketch. Also mention its merits and demerits.

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Hall Ticket Number :										

R-14

Code: 4G533

II B. Tech. I-Semester Regular Examinations Nov/Dec 2015

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) Distinguish between Intensive and extensive properties with examples 6M

   b) If the temperature scale is graduated according to the equation $t = 100 + 3t_c$ where t is the temperature reading on the scale and t_c is Celsius temperature. Find

   (**i**) freezing and boiling point of the thermometric substance and

   ii) The absolute temperature corresponding to 200 temperature reading on the scale. 8M

OR

2. a) Show that heat is a path function and not a property of the system 6M

   b) A mass of air is initially at 260^0C and 700 kPa and occupies 0.028m^3. The air is expanded at constant pressure to 0.084 m^3. A polytropic process with n = 1.50 is then carried out, followed by a constant temperature process which completes a cycle. All the processes are reversible. **i**) Sketch the cycle in the p-v and T-s plane. **ii**) Find the heat received and heat rejected in the cycle, and **iii**) find the efficiency of the cycle. 8M

UNIT-II

3. a) Demonstrate using the second law, that free expansion is irreversible 6M

   b) A block of iron weighing 100 kg and having a temperature of 100^0C is immersed in 50 kg of water at a temperature of 20^0C. What will be the change of entropy of combined system of iron and water? Specific heats of iron and water are 0.45 and 4.18 kJ/kg K respectively. 8M

OR

4. a) Derive an expression for the availability of an open system. 6M

   b) Using an engine of 30% thermal efficiency to drive a refrigerator having a COP of 5, what is the heat input into the engine for each MJ removed from the cold body by the refrigerator? 8M

UNIT-III

5. a) What is steam quality? Develop relations for specific volume, enthalpy and internal energy for two-phase mixture. 6M

   b) A vessel containing 5 kg of steam at 8 bar and 250^0C is cooled by pouring water over the outer surface, till the inside pressure falls to 5 bar. Calculate

   i) the final state of the steam **ii)** heat loss **iii)** loss of internal energy. 8M

OR

6. a) Explain about critical point of steam. Why does the fusion line for water have negative slope? 6M

   b) 10 kg of water at 45^0C is heated at a constant pressure of 10 bar until it becomes superheated vapour at 300^0C. Find the change in volume, enthalpy, internal energy and entropy. 8M

UNIT-IV

7. a) Explain the generalized compressibility chart and explain its significance. 6M

   b) A gas mixture consists of 0.4 kg CO, 1.1 kg of CO_2 and1.5 kg of N_2. Determine
      (i) Mass fraction of each component.
      (ii) Mole fraction of each component.
      (iii) Average molar mass of the mixture.
      (iv) Gas constant of the mixture. 8M

OR

8. a) State Dalton's law of additive pressure 6M

   b) A gas mixture consists of 60% N_2 and 40% CO_2 by mole basis. Determine the gravimetric analysis of the mixture analysis of the mixture. 8M

UNIT-V

9. a) Derive an expression for the thermal efficiency of Diesel cycle and draw P-V & T-S diagrams. 6M

   b) An air standard diesel cycle has a compression ratio of 16. The pressure at the beginning of compression stroke is 1 bar and the temperature is 25˚C. The maximum temperature is 1400˚C. Determine the thermal efficiency and mean effective pressure for this cycle. Take γ=1.4. 8M

OR

10. a) Compare Otto, Diesel & Dual cycles on P-V diagram for the same maximum pressure & temperature. 6M

    b) A 4-stroke cylinder Diesel engine has a compression ratio of 20:1 and expansion ratio of 10:1. Find the cut-off ratio and air standard efficiency. 8M

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Hall Ticket Number :										

R-14

Code: 4G534

II B. Tech. I-Semester Regular Examinations Nov/Dec 2015

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) Asbestos
   b) Glass 4M

OR

2. Draw the conventional representation of the following
   a) External Threaded Screw
   b) Splined Shaft 4M

3. Show with an example the following dimensioning
   a) Co-ordinate dimensioning
   b) Dimensioning Tapered features 4M

OR

4. Draw the thread profiles with pitch 20mm
   a) Metric thread
   b) Acme thread 4M

Section-II

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

5. Draw sectional front view and side view of a split-muff coupling for a shaft of diameter 20mm. 10M

6. Draw the Hexagonal headed bolt with a nut and washer in position for right hand threaded bolt of dia 25mm. 10M

7. Draw the sectional front view and top view of the double riveted zig-zag lap joint to join plates of thickness 16mm. 10M

Section-III
Compulsory Question
Assembly Drawing

1x42=42 Marks

8. Details of a screw jack are shown in figure, assemble all the parts and drew it sectional front view.