

Date - 06/03/2017 (Monday)

Total No. of Pages: 01

Roll No.: 1668
B.Tech.

SECOND SEMESTER

Mid SEMESTER EXAMINATION

March, 2017

MA-102, Mathematics-II

Time: $1\frac{1}{2}$ Hours

Max. Marks: 25

Note: Attempt all questions and assume the missing values.

(1) State and prove Cayley-Hamilton Theorem.

(2) Investigate for what values of λ and μ the equations

$$x + y + z = 6; \quad x + 2y + 3z = 10; \quad x + 2y + \lambda z = \mu,$$

have

- (a) an unique solution
- (b) an infinite number of solutions
- (c) no solution.

(3) Solve $(D^2 - 6D + 9)y = 6e^{3x} + 7e^{-2x} - \log 2 + 3^x$.

(4) Use the method of Variation of parameters solve $(D^2 + a^2)y = \sec ax$.

(5) Solve the simultaneous different equations

$$\frac{d^2x}{dt^2} - 3x - 3y = 0; \quad \frac{d^2y}{dt^2} + x + y = 0.$$

Total No. of Pages: 1

SECOND SEMESTER

MID SEMESTER EXAMINATION

AP-102: PHYSICS-II

Roll No.....

B.Tech. [All Groups]

March 2017

Time: 1.5 Hours

Max. Marks: 30

Note: Answer **ALL** questions.

Assume suitable missing data, if any.

1 [a] What is Compton effect? Derive an expression for the change in wavelength expected for a photon which is scattered through the angle ϕ by a particle of rest mass m_0 . Why is the Compton effect not observed for visible light? 5

[b] An electron has a de Broglie wavelength of $2 \times 10^{-12} m$. Find the phase and group velocities of its de Broglie waves. Rest mass energy of electron is 0.511 MeV. 5

2 [a] Consider a particle trapped in an infinite potential box of width a ,

$$V(x) = \begin{cases} 0, & 0 < x < a \\ \infty, & \text{otherwise} \end{cases}$$

Write the Schrodinger equation for this particle and hence get the expressions for the energy eigen values and energy eigen functions for the particle. Draw the probability densities for its first two wave functions. 5

[b] The effective Q for the proton-proton cycle is 26.2 MeV. (i) Express this as energy per kilogram of hydrogen consumed, (ii) The power of the sun is $3.9 \times 10^{26} W$. If its energy derives from the proton-proton cycle, at what rate is it losing hydrogen? (iii) At what rate is it losing mass? (iv) Account for the difference in the results for (ii) and (iii). 5

3 [a] Define binding energy of a nucleus. Sketch the binding energy per nucleon versus mass number curve. Mention important findings of the curve. 5

[b] What is liquid drop model of a nucleus? Derive Von-Weizsacker semi empirical binding energy formula. Use the semi empirical binding energy formula to calculate the binding energy of $^{40}_{20}Ca$.

$$(a_v = 14.1 \text{ MeV}; a_s = 13.0 \text{ MeV}; a_c = 0.595 \text{ MeV}; a_a = 19.0 \text{ MeV}; a_p = 33.5 \text{ MeV})$$

Total No. of Pages: 01

B. Tech. [Group B]

MID SEMESTER EXAMINATION

AC-102 CHEMISTRY

Roll No. 1000

Second Semester
(March-2017)

Time: 1 Hour 30 Min.

Max. Marks: 30

Note: Answer any Five questions.

Assume suitable missing data, if any.

Q1. (a) A 25 mL sample of a white dinner wine required 10.74 mL of 0.03776 M NaOH to achieve a phenolphthalein end point. Express the acidity of the wine in terms of grams of tartaric acid ($C_4H_6O_6$) per 100 mL (Assume that both acidic protons of tartaric acid are titrated). [3 marks]

(b) Draw the structures of Phenolphthalein and EBT indicators and circle the chromophores in these molecules. [1 + 2]

Q2. (a) What is Volhard's method for the determination of chloride ions? With the help of reactions discuss in detail. [3 marks]

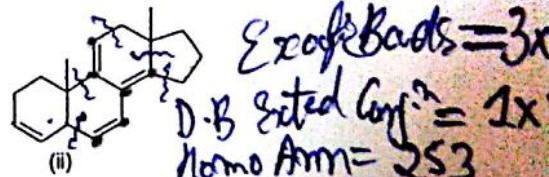
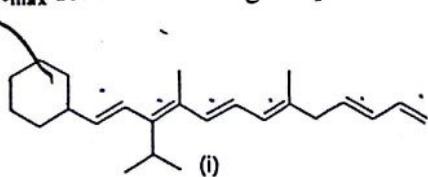
(b) Explain three important applications of Differential Scanning Calorimetry (DSC) with the help of suitable examples. [3 marks]

Q3. (a) Explain in detail a titration method for the determination of temporary, permanent and total hardness of water. Show the reactions involved. [3 marks]

(b) What are titration curves? Explain their importance. Draw the titration curve for the titration of a strong acid and a weak base. [3 marks]

Q4. (a) Discuss three important applications (with examples) of UV-Visible Spectroscopy. [3 marks]

(b) Predict the λ_{max} for the following compounds using the Woodward-Fieser rules: [3 marks]

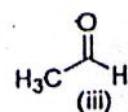
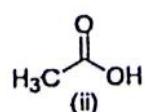
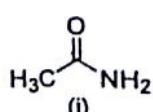


Q5. (a) Thermogravimetric Analysis (TGA) can be used for the qualitative as well as the quantitative analysis. Justify the statement with suitable examples. [3 marks]

(b) Arrange the expected electronic transitions for 2-propanone in order of their increasing energy. Explain the order. [3 marks]

Q6. (a) What are the Functional Group Region and Finger Print Region in the IR spectrum? Discuss the interpretation and significance of these regions. [3 marks]

(b) Arrange the following compounds in the increasing order of their expected wave numbers for stretching vibrations of C=O functional group. Explain the trend. [3 marks]



B.Tech.

IInd SEMESTER

Mid TERM EXAMINATION

March 2017

ME-104 : BASIC MECHANICAL ENGG.

Time: 1.5:00 Hours

Max. Marks: 25

Note: Use separate Answer Sheet for part-A and part-B. Answer all 5 questions from each part. Each question carries equal mark. Assume suitable missing data, if any.

Part A

1. (i) What is a thermodynamic system and what is the difference between closed system and Open system. (1.5)
(ii) What are thermodynamic properties? (1)
2. (i) Derive work done when $PV=$ Constant. (1.5)
(ii) State the differences between Path function and Point function. (1)
3. (i) Explain First Law for closed system undergoing a cycle. (1.5)
(ii) Explain the First law for a closed system undergoing a change of State. (1)
4. (i) Derive and explain the expression for Specific heat at constant Volume. (1.5)
(ii) Derive and explain the expression for Specific heat at constant Pressure. (1)
5. (i) Write down the expression and explain the notations and units for energy balance in steady flow Process. (1.5)
(ii) Write down the expression and explain the notations and units for mass balance in steady flow Process. (1)

Part B

- ~~1.~~ State the characteristics and applications of Nodular Cast Iron. Why does Grey Cast Iron prove an ideal material for beds of machine tools? (2.5)
- ~~2.~~ (i) What is understood by toughness of Steel? How does it vary with increase in percentage of Carbon in Steel? (1.5)
(ii) What is understood by the Alloy Steel designation, XT98W6Mo5Cr4V1? (1)
- ~~3.~~ (i) In Brasses, how are tensile strength, hardness and electrical conductivity affected by increase in percentage of Zn? (1.5)
(ii) Detail the characteristics and uses of Duralumin. (1)
- ~~4.~~ (i) Discuss the characteristics and applications of Thermosetting Plastics. (1.5)
(ii) Define a Composite, naming any one matrix material and any one reinforcing material. (1)
- ~~5.~~ (i) What are the characteristics of a good pattern material? Sketch and state the functions of any three tools, used in mould making. (1.5)
(ii) What is understood by Cores and Coreprints? (1)

Total No. of Pages 1

FIRST SEMESTER (Group -A)
Mid Semester Examination

Roll No. 1000

B. Tech.

March 2017

HU-101 COMMUNICATION SKILLS

Time: 1.30 hours

Max Marks: 25

Note: Answer all the questions

1. Give phonetic transcriptions of the following words: 10

Smooth, alloy, encyclopedia, treacle, nautical, partial, Pangaea, matter, wave, edge

2. Fill in the blanks: 5

- They are not as rich as----- (us, them)
- The cost of all these apples----- (has, have) risen.
- Thousand rupees (is, are) a big sum.
- All passed except----- (he, him).
- None of the suspected men _____ (was, were) arrested.

3. Add conditional clauses using if, whether, unless or until. 5

- She can wait for you-----.
- They can join our group-----.
- He may leave for Delhi tomorrow-----.
- Sita will go with you-----.
- I am ready to help you-----.

4. Write an essay on one of the following topics: (500 Words) 5

- Donald Trump's victory
- India's next president

Total No. of Pages: 03
IInd SEMESTER

KOV

Roll No:.....1668.....

B. Tech.

END SEMESTER EXAMINATION

May 2017

MA - 102 Mathematics-II

Time: 3 Hours

Max. Marks: 50

Note: Attempt all the questions by selecting any two parts from each question.

- (1) (a) Define the eigen value and eigen vector and find out it for the matrix

$$\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}.$$

Verify that the eigen vectors are orthogonal.
(b) Solve the differential equation

$$\frac{d^4y}{dx^4} + 2\frac{d^2y}{dx^2} + y = x^2 \cos x.$$

(c) Solve

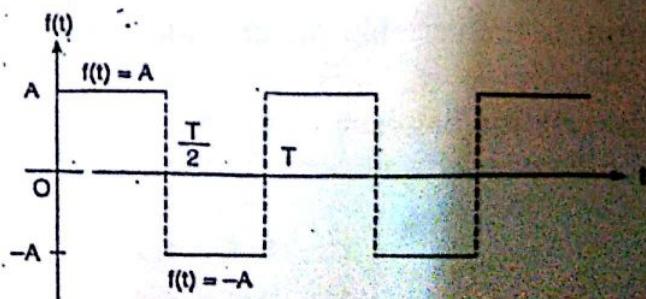
$$x^2 \frac{d^2y}{dx^2} + 3x \frac{dy}{dx} + y = \frac{1}{(1-x)^2}$$

(10)

- (2) (a) Show that

$$\frac{A}{s} \tanh \frac{sT}{4}$$

is the Laplace transforms of rectangular periodic wave of period T given by



(b) Define the *unit step function* and by Laplace transforms, find the solution of the initial value problem

$$y'' + 9y = 9u(t - 3), \quad y(0) = y'(0) = 0,$$

where $u(t - 3)$ is the unit step functions.

(c) Evaluate

$$(i) L[t^2 \cos 3t]$$

$$(ii) L^{-1} \left[2(s+1)/(s^2 + 2s + 2)^2 \right] \quad (10)$$

(3) (a) Write the *Bessel's differential equation* and find out its *general solution*.

(b) Solve in series the equation

$$x \frac{d^2y}{dx^2} + \frac{dy}{dx} - y = 0.$$

(c) State and prove the *Rodrigue's formula*. (10)

(4) (a) With the help of *convolution theorem*, find

$$L^{-1} \left[\frac{s}{(s^2 + a^2)^2} \right].$$

(b) The following table gives the variations of a periodic current over a period

t (secs)	0	T/6	T/3	T/2	2T/3	5T/6	T
A (amp.)	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Show, by numerical analysis, that there is a direct current part of 0.75 amp. in the variable current and obtain the amplitude of the first harmonic.

(e) Find the relation between $J_n(x)$ and $J_{-n}(x)$. (10)

(5) (a) Find the *Fourier cosine series* of the function

$$f(x) = \begin{cases} x^2, & 0 \leq x \leq 2 \\ 4, & 2 \leq x \leq 4. \end{cases}$$

(b) Find the Fourier series expansion of the periodic function of period 4

$$f(x) = \begin{cases} 2+x, & -2 \leq x \leq 0 \\ 2-x, & 0 < x \leq 2, \end{cases} \quad f(x+4) = f(x).$$

(c) Find the Fourier transform of the function

$$f(t) = e^{-at}, \quad -\infty < t < \infty, \quad a > 0.$$

Also find out inverse transform of it.

(10)

Total No. of Pages: 2

Roll No. 1668.....

SECOND SEMESTER

B.Tech. [All Groups]

END SEMESTER EXAMINATION

May 2017

AP-102: PHYSICS-II

Time: 3 Hours

Max. Marks: 40

Note: Attempt any **FIVE** questions. Q.No.1 is compulsory.
Assume suitable missing data, if any.

1. [a] Differentiate between conventional and induced electric fields. (2)

[b] Write down the integral form of Maxwell's equation. (2)

[c] Draw the equivalent circuit of an ideal Zener diode in the breakdown region. (2)

[d] What value of series resistor is required to limit the current through a LED to 20 mA with the forward voltage drop 1.6 V when connected to a 10V supply? (2)

2. [a] Evaluate the expectation value for the kinetic energy of a particle in one dimensional rigid box in the n^{th} quantum state. (4)

[b] The normalized state of the free particle is given by a wave function

$$\Psi(x, 0) = N \exp[-(x^2/2a^2) + iK_0x]$$

(i) Find the factor of N,

(ii) In what region of space the particle is most likely to be found. (4)

3. [a] Describe the Maxwell's distribution of the speed for the molecules of gas and deduce the formula for mean, root mean square and most probable speed. (4)

[b] Discuss the salient feature of Maxwell's Boltzmann, Fermi Dirac and Bose Einstein's statistics. Give the comparative picture of three statistics. (4)

4. [a] Explain the Liquid Drop Model and compare it with Shell model. (4)

[b] Using the information on the atomic masses as given below, show that a nucleus of a uranium can disintegrate with emission of alpha particle according to the relation



Calculate

(i) The total energy released in the disintegration.

(ii) The K.E. of alpha particle, the nucleus being at rest before disintegration.

Mass of U^{238} = 238.12492 a.m.u, Mass of Th^{234} = 234.11650 a.m.u,
mass of He^4 = 4.00387 a.m.u (4)

a] Explain the velocity of Electromagnetic wave (EM) in isotropic dielectric medium is less than the velocity EM wave in free space. (4)

b] Assuming that all the energy from a 1000 W lamp is radiated uniformly; calculate the average values of intensities of electric and magnetic fields of radiations at a distance of 2 meter from the lamp. (4)

6. [a] Derive an expression for collector current for common emitter configuration with circuit diagram and draw its input and output characteristics. (4)

[b] A n-p-n transistor at room temperature has its emitter disconnected. A voltage of 5V is applied between collector and base with collector positive, a current of 0.2 μA flows. When the base is disconnected and the same voltage is applied between collector and emitter, the current is found to be 20 μA . Find α , I_E and I_B when I_C is 1 mA. (4)

7. [a] What is Poynting vector? How the Poynting theorem derived from the Maxwell's curl equation. Explain Poynting theorem. (4)

[b] At what temperature we can expect a 10% probability that electrons in a metal will have an energy which is 1% above E_F ? The Fermi energy of the metal is 5.5 eV, $T=?$ (4)

AC-102 CHEMISTRY

Time: 3 Hours

Max. Marks: 40

Note: Answer any Eight questions.

Assume suitable missing data, if any.

Q1. [a] Explain whether the Atom Economy of a rearrangement reaction is expected to be higher or lower than that of an elimination reaction. Justify your answer with the help of suitable examples. **[2.5 marks]**

[b] An environmental chemist analyzed a sample of the waste material from an industrial process known to produce the compounds carbon tetrachloride (CCl_4) and benzoic acid. A 1.2 g sample of this sample was placed in water and shaken vigorously to dissolve all the benzoic acid. The resulting aqueous solution required 42.36 mL of 0.0773 M NaOH for neutralization. Calculate the mass percentage of benzoic acid in the original sample. **[2.5 marks]**

Q2. [a] Describe the principle of Differential Scanning Calorimetry (DSC) and discuss its comparisons with DTA. **[2.5 marks]**

[b] How would you distinguish between the two isomers, Propanol-1 and Propanol-2 on the basis of their $^1\text{H-NMR}$ spectrum? Explain in detail and justify your answer. **[2.5 marks]**

Q3. [a] Discuss the expected Mass spectrum of Pentan-3-one. **[2.5 marks]**

[b] Describe at least 5 qualities of Li-ion batteries that make these an attractive choice for the application in electronic gadgets? **[2.5 marks]**

Q4. [a] Draw the structures of Kevlar and Bakelite, and also mention their applications. **[2.5 marks]**

[b] Calculate the Weight average molecular weight for a thermoplastic for which the mean molecular weight M_i and mean molecular weight fraction W_i values are listed below: **[2.5 marks]**

M_i	W_i
7,500	0.12
12,500	0.17
17,500	0.25
22,500	0.23
27,500	0.14
32,500	0.09

Q5. [a] What is Hooke's law in IR spectroscopy. Discuss two factors that affect the vibrational frequency. [2.5 marks]

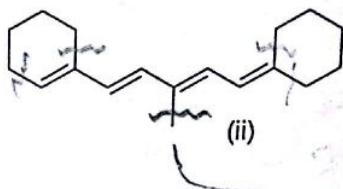
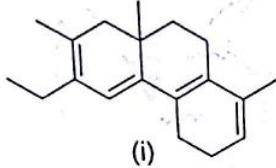
[2.5 marks]

[b] What are Copolymers? Write the structures of two important Copolymers. [2.5 marks]

[2.5 marks]

Q6. Predict the λ_{\max} for the following compounds using the Woodward-Fieser rules: [2.5 + 2.5]

$$[2.5 + 2.5]$$



Q7. Write short notes on the following:

$$[2.5 + 2.5]$$

~~[a]~~ Natural Indicators

[b] Electroplating

Q8. Define Phase, Component and Degree of Freedom. Discuss Sulphur system with the help of phase diagram. [2.5 + 2.5]

[2.5 + 2.5]

Q9. What is Green Chemistry? Explain Green reagents, Green solvents and Green catalysts with the help of two examples each. [5 marks]

[5 marks]

Q10. The Govt. of India recently announced the field trials of plastic notes of ₹ 10 denomination in five Indian cities. Polypropylene (PP) is a commonly used polymer used for making such plastic currency notes. Suggest a suitable method for the synthesis of PP and explain the mechanism for the polymerization reaction in detail. Also comment on the tacticity in Polypropylene. [5 marks]

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2nd SEMESTER

END SEMESTER EXAMINATION

Roll No. 1668

B.Tech.

May 2017

ME-104 BASIC MECHANICAL ENGG.

Time: 3:00 Hours

Max. Marks: 50

Note: Use the single Answer sheet. Answer any 5 questions from part A and any 5 questions from part B. Each question carries 5 marks. Assume suitable missing data, if any.

Part A

- ~~1.~~ Explain with schematic diagram the working principle of a (a) Thermal Power Plant (b) Hydro Electric Power Plant
- ~~2.~~ A reversible heat Engine operates between two reservoirs at temperature of 600°C and 40°C. The heat transfer to the heat engine is 2000kJ. Find the heat rejected , the work done by the engine and the Thermal Efficiency of the Carnot's Engine.
- ~~3.~~ (a) Derive the efficiency of Otto cycle in terms of Compression ratio.
(b) Draw the P-V and T-S diagram of the Diesel cycle with all notations.
4. State and prove the Carnot's Theorem.
- ~~5.~~ An oil film of thickness 1.5 mm is used for lubrication between a square plate of size 0.9 m x 0.9 m and an inclined plane having an angle of inclination 20 degree. The weight of the square is 392.4 N and it slides down the plate with a uniform velocity of 0.2 m/s. Find the dynamic viscosity of the oil.
6. (a) State and Prove Pascal's Law
(b) Derive an expression for the Pressure variation in a fluid at rest.
7. State the Bernoulli's theorem mathematically and calculate the following. Water is flowing through a pipe of 100 mm diameter under a Pressure of 19.62 N/cm² and with mean velocity of 3.0 m/s. Find the total head of the water of a cross section which is 8m above the datum line.

Part B

1. (a) Explain various types of Engineering materials with the help of their hierarchical view.
(b) State the effects of any two of the alloying elements Cr, Mo and V on the properties of steel.
2. (a) State the desirable properties of materials used for making cutting tools. Discuss diamond tools or Ceramic tools.
(b) What do you understand from term composites. Explain with examples & uses.
3. (a) Discuss allowances , used for making pattern.
(b) Explain the properties of moulding sand.
- 4.(a) Discuss the working principle of Oxy-Acetylene welding with neat sketches.
(b) Explain the various types of Welding defects.
5. (a) Explain Hot Die Casting process .
(b) State the operations, which can be performed on a milling machine. Sketch and explain any one milling cutter.
6. (a)What is Comparator? Explain the working principle of an optical comparator.
(b) Differentiate between the line standard and End Standard.
7. (a) Explain either an external micrometer, or a dial indicator with the help of appropriate sketches.
(b) What is the difference between standard gauges and limit gauges?
Sketch progressive limit plug gauges.

HU-102 COMMUNICATION SKILLS

Time: 3.00 hours

Max Marks: 50

Note: Answer all the questions

Assume suitable missing data, if any

1. Explain with reference to the context: 10

a) The soul scrambles across the screes.

b) He asks me to look out for you.

2. 'Victor Frankenstein is an embodiment of the deep rooted human ambitions and insecurities'. Comment. 10

3. Write phonemic transcriptions of the following:

pride, intelligence, bloom, field, collection, write, assume, scheme, dais,
seismic 10

4. Label which type of word they are, Monosyllabic, disyllabic or
polysyllabic : 05

temporary, linger, contamination, forgive,

5. Write technical descriptions on any one of the following: 05

Printer, light bulb, Tsunami

6. Write an essay on the following topic: (500 Words) 10

a) Technology for Masses

b) Women in sports