

Total No. of Pages: 01

Roll No:..... 1756

**FIRST SEMESTER**

**B.Tech.**

**MID SEMESTER EXAMINATION**

(Sep. 2016)

**MA-101 MATHEMATICS-I**

Time: 1 Hr. 30 Min.

Max. Marks: 25

Note: Attempt **ALL** questions. All questions carry equal marks

✓(1) Test the convergence of the series:

$$x^2(\log 2)^p + x^3(\log 3)^p + x^4(\log 4)^p + \dots \quad (x > 0).$$

✓(2) Examine the series

$$\sum_{n=2}^{\infty} \frac{(-1)^n}{n(\log n)^2}$$

for convergence and absolute convergence.

✓(3) Prove by Taylor's Theorem

$$\tan^{-1}(x+h) = \tan^{-1}x + (h \sin \alpha) \cdot \sin \alpha - (h \sin \alpha)^2 \cdot \frac{\sin 2\alpha}{2} + (h \sin \alpha)^3 \cdot \frac{\sin 3\alpha}{3} + \dots$$

where  $\alpha = \cot^{-1}x$ .

✓(4) Find the radius of curvature at any point  $(r, \theta)$  on the curve

$$\sqrt{r} \cos \theta / 2 = \sqrt{a}.$$

✓(5) Find the surface of the solid generated by revolving the loop of the curve

$$3ay^2 = x(x-a)^2$$

about the x-axis.

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1756

Roll No. ....

Mid Semester Examination  
Sep. 2016

Total No. of Pages 1  
FIRST SEMESTER  
B.Tech.(Group -A)

HU-101 COMMUNICATION SKILLS

Max Marks:25

Time: 1:30 hours

Note: Answer all the questions  
Assume suitable missing data, if any

1. Transcribe the following: File, chapter, indulge, student, subject, receive, discipline, university, cinch, queen

10

3

2. Add question tags:

- a) He is perfect in driving cars-----?
- b) They can now enter the playground-----?
- c) You cannot help students-----?
- d) These notes are not for you-----?
- e) She can give presentation now-----?
- f) Life is beautiful-----?

3. Fill in the blanks with conditional clauses (use if, whether, unless, until): 3

- a) I will be back by evening-----
- b) You can go to office-----
- c) People can buy medicines from this store-----
- d) She can score full marks-----
- e) He will reach Delhi by tomorrow morning-----
- f) She will wait till six-----

4. Make sentences to differentiate the meaning:

4

Mettle, metal

Suite, suit

5. Write an essay on 'DTU of my dreams' or 'health for all' in about 450 words.

5

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Roll No. .... 1756

I<sup>st</sup> Semester

B.Tech.

MID TERM EXAMINATION

September 2016

ME-101 BASIC MECHANICAL ENGG.

Time: 1.5 Hours

Max. Marks: 25

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

Part A

1. Derive expressions for work done in quasi static process (2.5)  
(a) when  $PV = \text{constant}$  (b) when  $PV^Y = \text{constant}$
2. Explain and derive Expressions for (2.5)  
(a) specific heat at constant volume  $C_v$ ,  
(b) specific heat at constant pressure  $C_p$
3. Explain the first law for a closed system (2.5)  
(a) undergoing a cycle (b) undergoing a change of state
4. Write and explain units of all the terms used in  
(a) Mass balance continuity equation  
(b) Steady state steady flow energy equation (2.5)
5. Write short notes on : (2.5)  
(a) Path function and point function  
(b) Thermodynamic equilibrium

Part B

1. Differentiate between steel & cast iron with reference to their carbon percentage, tensile strength, hardness and toughness. (2.5)
2. Differentiate between thermosets and thermoplasts polymers. Explain with their examples and applications (2.5)
3. What do you understand by casting process? Explain with its neat sketch. (2.5)
4. What are the types of pattern allowances (2.5)
5. Classify the engineering material with hierarchical view (2.5)

Total No. of Pages: 1

FIRST SEMESTER

MID SEMESTER EXAMINATION

AP-101: PHYSICS-I

Roll No.....**1756**

B.Tech. [All Groups]

Sept 2016

Time: 1.5 Hours

Max. Marks: 30

Note: Attempt **ALL** questions.

Assume suitable missing data, if any.

1. What is the idea behind performing the Michelson-Morley experiment. Discuss the experiment with suitable drawings and explain the significance of the result obtained. (6)
2. [a] A rod placed in a frame of reference, is moving with a velocity  $0.8c$  in a direction (i) parallel to its length and (ii) at an angle  $45^\circ$  with its length. Calculate the percentage contraction in each case. What is the orientation of the rod in the moving frame of reference in the case (ii). (3)  
[b] A man leaves the earth in a spacecraft that makes a round trip to the nearest star 4 light years distant, at a speed of  $0.9c$ . How much younger is he upon his return than his twin brother who remained behind? (3)
3. [a] A stationary body explodes into two fragments each of mass  $1.0\text{ kg}$  that move apart at speeds of  $0.6c$  relative to the original body. Find the mass of the original body. (3)  
[b] What is the energy of a photon whose momentum is the same as that of a proton whose kinetic energy is  $10\text{ MeV}$ ? Rest masss of the proton is  $1000\text{ MeV}/c^2$ . (3)
4. [a] Discuss the formation of Newton's rings in reflected monochromatic light and show that the diameters of Newton's dark rings are proportional to the square root of natural numbers. (3)  
[b] Explain how Newton's rings experiment can be used to find the wavelength of the light source used. (3)
5. [a] Discuss the interference of light in a thin parallel film and obtain the conditions for brightness and darkness for reflected light. (3)  
[b] Interference fridges are produced by monochromatic light falling normally on a wedge shaped film of refractive index 1.40. If the angle of the wedge is 20 seconds of an arc and the distance between successive fridges is 0.25 cm, calculate the wavelength of light. (3)

Time: 1 Hour 30 Min.

Max. Marks: 30

**Note:** Answer any Five questions.

Assume suitable missing data, if any.

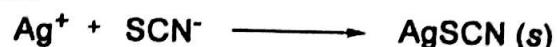
**Q1.** Briefly explain the Ostwald's theory of indicators and also its limitations. How does the Structural theory address the limitations of Ostwald's theory? [3 + 3]

**Q2. (a)** Explain in detail a titration method for the determination of Dissolved oxygen in a water sample. Show the reactions involved. [3 marks]

**(b)** Titration of  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  in a 50 mL sample of hard water required 23.65 mL of 0.01205 M EDTA. A second 50 mL aliquot of the hard water sample was made strongly basic with NaOH to precipitate  $\text{Mg}^{2+}$  as  $\text{Mg}(\text{OH})_2(s)$ . The supernatant liquid required 14.53 mL EDTA of 0.01205 M for titration. Calculate: [3 marks]

- (i)** The total hardness of the water sample, expressed as ppm  $\text{CaCO}_3$ .
- (ii)** The concentration in ppm of  $\text{CaCO}_3$  in the sample.
- (iii)** The concentration in ppm of  $\text{MgCO}_3$  in the sample.

**Q3. (a)** The arsenic in a 1.010 g sample of a pesticide was converted to  $\text{H}_3\text{AsO}_4$  by suitable treatment. The acid was then neutralized, and 40.00 mL of 0.06222 M  $\text{AgNO}_3$  was added to precipitate the arsenic quantitatively as  $\text{Ag}_3\text{AsO}_4$ . The excess  $\text{Ag}^+$  in the filtrate and the washings from the precipitate was titrated with 10.76 mL of 0.1000 M KSCN; the reaction was: [3 marks]

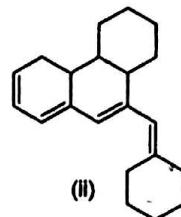
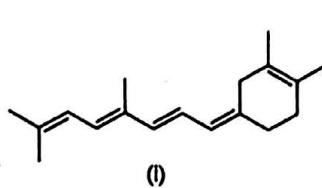


Calculate the %  $\text{As}_2\text{O}_3$  in the pesticide sample. [Atomic mass of As: 74.92, Ag: 107.86]

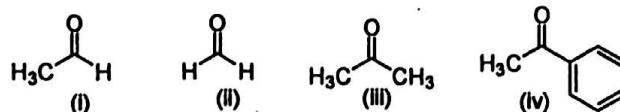
**(b)** Describe the principle and applications of Thermogravimetric Analysis (TGA). [3 marks]

**Q4. (a)** What is Beer-Lambert law? Discuss its applications as well as limitations. [3 marks]

**(b)** Predict the  $\lambda_{\text{max}}$  for the following compounds using the Woodward-Fieser rules: [3 marks]



**Q5. (a)** 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)** Paracetamol is an important medicine and is used as an Analgesic (pain reliever) and Antipyretic (fever reducer). It is often prescribed by the doctors for relieving the symptoms for Dengue and Chikunguniya diseases that are quite common these days. Draw and briefly discuss the predicted <sup>1</sup>H-NMR spectrum of Paracetamol. [3 marks]



**Q6. (a)** What are Chromophores and auxochromes? Explain with examples. [3 marks]

**(b)** Differential Scanning Calorimetry (DSC) can be used for the qualitative as well as the quantitative analysis of organic samples. Justify the statement with suitable examples. [3 marks]

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**FIRST SEMESTER  
END SEMESTER EXAMINATION**

**B.Tech. (Common for ALL)**  
**(NOV. 2016)**

**MA-101 MATHEMATICS-I**

**Time: 3 Hrs.**

**Max. Marks: 50**

**Note:** Attempt All questions by selecting Any Two from each question.  
Assume missing data if any. All questions carry equal marks

(1) (a) *State and prove Cauchy's necessary condition for convergence of a positive term infinite series. Is converse true? Justify with a suitable example.*

(b) *Test for the convergence of the following infinite series.*

$$1 + \frac{1}{2}x + \frac{2!}{3^2}x^2 + \frac{3!}{4^3}x^3 + \frac{4!}{5^4}x^4 + \dots + \infty, \quad (x > 0).$$

(c) *Discuss the convergence and absolutely convergence of the following infinite series:*

$$\frac{1}{2^3} - \frac{1}{3^3}(1+2) + \frac{1}{4^3}(1+2+3) - \frac{1}{5^3}(1+2+3+4) + \dots$$

(2) (a) *The tangents at two points P and Q on the cycloid*

$$x = a(\theta - \sin \theta), \quad y = a(1 - \cos \theta)$$

*are at right angles. Show that if  $\rho_1$  and  $\rho_2$  are the radii of curvature at these points, then  $\rho_1^2 + \rho_2^2 = 16a^2$ .*

(b) *Find the whole length of the loop of the curve*

$$3ay^2 = x(x-a)^2.$$

(c) *Find the volume of the solid generated by revolving the lemniscate*

$$r^2 = a^2 \cos 2\theta$$

*about the line  $\theta = \pi/2$ .*

(3) (a) Transform

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$$

into polar coordinates.

(b) Obtain Taylor's expansion of  $\tan^{-1} \frac{y}{x}$  about  $(1, 1)$  up to and including second degree terms.

(c) Find the maximum and minimum distances of the point  $(3, 4, 12)$  from the sphere  $x^2 + y^2 + z^2 = 1$ .

(4) (a) Evaluate

$$\int_0^2 \int_0^{\sqrt{2x-x^2}} (x^2 + y^2) dy dx$$

(b) Show that

$$\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}.$$

(c) Find the volume enclosed between the cylinders  $x^2 + y^2 = ax$  and  $z^2 = ax$ .

(5) (a) Define gradient of a scalar point function and explain its geometrical significance. Find the directional derivative of  $\vec{F} = 2x^2y^3 + 6xy$  at  $(1, 1)$  in the direction of a unit vector, whose angle with the positive  $x$ -axis is  $\pi/6$ .

(b) Find the work done when a force

$$\vec{F} = y(1+z)\vec{i} + (x+3z^3+xz)\vec{j} + (9yz^2+xy-1)\vec{k}$$

moves a particle from  $(1, 1, 1)$  to  $(2, 1, 4)$ .

(c) Verify Gauss divergence theorem for  $\vec{A} = 4x\vec{i} - 2y^2\vec{j} + z^2\vec{k}$  taken over the region bounded by  $x^2 + y^2 = 4$ ;  $z = 0$  and  $z = 3$ .

Total No. of Pages: 2

FIRST SEMESTER

END SEMESTER EXAMINATION

1756  
Roll No.....

B.Tech. [All Groups]

Nov.-Dec. 2016

**AP-101: PHYSICS-I**

**Time: 3 Hours**

**Max. Marks: 40**

Note: Attempt any **FIVE** questions.

Assume suitable missing data, if any.

- 1 [a] State and deduce the mathematical expression for the law of addition of relativistic velocities. In the laboratory two particles are observed to travel in opposite directions with speed of  $2.7 \times 10^{10}$  cm/s. What is the relative speed of the two particles? 4
- [b] A neutral meson of Energy E moving at a speed v decays into two  $\gamma$ -rays, one is of energy  $E_1 = 70$  MeV along the direction of the neutral meson and the other is of energy  $E_2 = 60$  MeV opposite to the former. Calculate the rest mass of the meson. 4
- 2 [a] Discuss the reflection and transmission of waves on a string at a boundary and derive the expressions for reflection and transmission coefficients for energy. 4
- [b] What power is needed to send waves of amplitude 1 cm and frequency 10 hertz down a string that has mass per unit length  $\rho = 0.1$  kg/m and tension T equal to 100 Newtons? 4
- 3 [a] Write down the equation of motion for a damped harmonic oscillator. Obtain the general solution for its displacement as a function of time in the case of light damping and compare it with the displacement in the case of free oscillator. 4
- [b] What is the general expression for the velocity for a simple damped mechanical oscillator driven by a force  $F_0 \cos \omega t$ ? Derive the expressions for the (i) Frequency of maximum velocity and (ii) Maximum velocity. Also plot the variation of the amplitude of velocity versus driving force frequency ( $\omega$ ) for two different values of damping constants. 4

4 [a] How would you produce polarized light by reflection? What is Brewster's law? Calculate the angular position of the sun above the horizon so that light reflected from a calm lake is completely polarized. The refractive index of water is 1.33. 4

[b] How would you ascertain the correct state of polarization (i.e. circularly, elliptically, plane, unpolarized, partial polarized etc.) of an unknown incoming beam of light with the help of a rotating nicol prism and a quarter wave plate? 4

5 [a] Discuss the phenomena of Fraunhofer diffraction at a single slit and show that the relative intensities of the successive maxima are  $1 : \frac{4}{9\pi^2} : \frac{4}{25\pi^2} :$   $\frac{4}{49\pi^2} : \dots \dots \dots$  4

[b] For an optical fibre, explain the terms: (i) acceptance angle, (ii) acceptance cone and (iii) numerical aperture. Show that numerical aperture is equal to  $\sqrt{\mu_1^2 - \mu_2^2}$ , where  $\mu_1$  and  $\mu_2$  are the refractive indices of the core and the cladding respectively. 4

6 [a] What is chromatic aberration? Find the condition of achromatism for the two lenses in contact. 4

[b] Find and plot cardinal points for a system of two converging lenses of focal lengths 30 cm and 10 cm and separated by a distance of 20 cm in air. 4

7 [a] Explain the terms: (i) Spontaneous emission (ii) Stimulated emission (iii) Metastable states and (iv) Population inversion. 4

[b] Explain the principle and working of a Ruby laser with clearly drawing the energy level diagrams. 4

Total No. of Pages: 02

Roll No. 1753

**B. TECH. (END SEM) EXAMINATION  
First Semester**

(November-2016)  
(Group-A)

**AC-101 CHEMISTRY**

**Time: 3 Hours**

**Max. Marks: 40**

**Note:** Answer any Eight questions.  
Assume suitable missing data, if any.

- Q1. (a)** What are precipitation titrations? Explain with one example in detail. [2.5 marks]
- (b)** A 3.00 L sample of urban air was bubbled through a solution containing 50 mL of 0.0116 M Ba(OH)<sub>2</sub>, which caused the CO<sub>2</sub> in the sample to precipitate as BaCO<sub>3</sub>. The excess base was back-titrated to a phenolphthalein end point with 23.6 mL of 0.0108 M HCl. What is the concentration of CO<sub>2</sub> in the air in ppm (that is, mL CO<sub>2</sub>/10<sup>6</sup> mL air); use 1.98 g/L for the density of CO<sub>2</sub>. [2.5 marks]
- Q2. (a)** List and briefly explain five important principles of Green Chemistry. [2.5 marks]
- (b)** Using suitable examples, discuss two applications of Mass Spectrometry in detail. [2.5 marks]
- Q3. (a)** Describe the principle of Differential Thermal Analysis (DTA) and discuss its comparisons with DSC. [2.5 marks]
- (b)** Can you distinguish (Yes/No) between the two isomers CH<sub>3</sub>COCH<sub>3</sub> and CH<sub>3</sub>-CH<sub>2</sub>-CHO on the basis of <sup>1</sup>H-NMR and IR spectroscopy? Explain in detail and justify your answer. [2.5 marks]
- Q4. (a)** Alkanes can be cracked to form alkenes. Decane can be cracked to form two products:  
$$\text{C}_{10}\text{H}_{22} \longrightarrow \text{C}_2\text{H}_4 + \text{C}_8\text{H}_{18}$$
If only the alkene is the desired product, what is the atom economy of this process? If both products are desired, what will be the atom economy? [2.5 marks]
- (b)** List and explain 5 important properties of batteries. [2.5 marks]

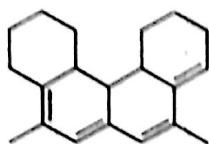
- Q5. (a)** Draw the structure of Nylon-6,6 and Bakelite, and also mention their applications. [2.5 marks]
- (b)** A polymer has been found to possess the population of various molecules as follows:
- (i) 10 molecules of molecular mass each 20000.
  - (ii) 20 molecules of molecular mass each 24000.
  - (iii) 40 molecules of molecular mass each 40000.
  - (iv) 40 molecules of molecular mass each 60000.
  - (v) 20 molecules of molecular mass each 100000.

Calculate its Number Average Molecular weight, Weight Average Molecular weight and P.D.I. [2.5 marks]

**Q6. (a)** Discuss Electroplating and explain in details the various components of the electroplating bath and their composition. [2.5 marks]

**(b)** ~~Teflon~~ is an important polymer that has many applications. One important application is that it is used to make non-stick cooking pans. Discuss the mechanism of Free radical polymerization using a suitable monomer for the synthesis of Teflon. [2.5 marks]

**Q7 (a)** Predict the  $\lambda_{\max}$  for the following compound using the Woodward-Fieser rules. [2.5 marks]



**(b)** Discuss various types of vibration modes in IR Spectroscopy using suitable diagrams.

[2.5 marks]

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

**Q9.** Write short notes on any two of the following: [2.5 x 2]

- a) Fuel Cells
  - b) Lithium Ion Batteries
  - c) Green Reagents.
-

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Roll No. .... 1756

I<sup>st</sup> SEMESTER

B.Tech.

END SEMESTER EXAMINATION

Nov./Dec.-2016

ME-101: BASIC MECHANICAL ENGG.

Time: 3:00 Hours

Max. Marks: 50

Note: Answer part-A in half of Answer Sheet and part-B in another half.  
Answer 5 questions from each part. Each question carries equal mark.  
Assume suitable missing data, if any.

### Part A

1. Show the four energy interactions of a cyclic heat engine and derive an expression for thermal efficiency and also explain Kelvin Planck statement of second law as well as Clausius statement of second law. (5)
2. Show that the COP of a heat pump is greater than COP of a refrigerator by unity and calculate the heat rejected per KW net output of a reversible heat engine operating between a source temperature of  $800^{\circ}\text{C}$  and a sink temperature of  $30^{\circ}\text{C}$ . (5)
3. Prove that the efficiency of the Otto's cycle depends only on the compression ratio also indicate P-V and T-S diagram for the diesel cycle. (5)
4. Calculate the dynamic viscosity of oil film of thickness 1.5 mm used for lubrication between a square plate of 0.8 m x 0.8 m and on an inclined plane having  $30^{\circ}$  inclination from the horizontal. The weight of the square plate is 300 N and it slides down the plane with a uniform velocity of 0.3 m/s. (5)
5. State and prove the Pascal's law. (5)
6. Give the statement of Bernoulli's theorem and find the total head of the water flowing through a pipe of 100 mm diameter under a pressure of 19.62 N/cm<sup>2</sup>(gauge).and with mean velocity of 3.0 m/s. The pipe is 8 m above the datum line. (5)
- 7 Derive an expression for pressure variation in a fluid at rest. (5)

Part B

1. ~~X~~ Describe the common sheet metal operations or processes with neat sketches. (5)

2. ✓ How the Pattern classified? Describe them with neat sketches and state the use of each of them. (5)

3. ✓ State the principle of Vernier Instrument. Explain briefly the construction and use of vernier callipers with neat sketch. (5)

4. ✓ Describe the types of Flames obtained in an Oxy-acetylene gas welding process giving the applications. (5)

5. What are the comparators? Write short notes on classification of comparators. (5)

6. ~~X~~ State the range of composition of low carbon, medium carbon and high carbon steels. Give two application of each range. (5)

7. ✓ Write short notes on:

(a) Shielded metal Arc welding (3)

(b) Differentiate between line and end standard (2)

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Roll. No.....

FIRST SEMESTER

B.TECH (Group A)

END SEMESTER EXAMINATION

NOV-2016

HU-102 COMMUNICATION SKILLS  
(New Scheme)

Time: 03: 00 Hours

Max.Marks: 50

**Note:** Answer all the questions

Assume suitable missing data, if any.

1. Explain the following with reference to the context: 10
- (a) He feels you as his atmosphere... and writes me long letters with stubby little pencils he steals from the public library
- (b) Where is he while you walk around the shaved lawn in your plus fours organizing with an electric clip board?
2. Compare Frankenstein with any science fiction book or movie you have read/seen. 10
3. Transcribe the following words:  
Chortle, apogee, mezzanine, creature, fallacy 5
4. Put stress mark and state what type of word they are.  
Perspiration, serology, mountaineer, trustee, pipette 10
5. Write technical descriptions of any one of the following: LED bulb, tornado 5
6. Write an essay on the following:  
Demonetization, employability skills for engineers 10