

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2018

## ENGINEERING PHYSICS - I

[Time : 3 hours

(Maximum marks : 100)

## PART — A

(Maximum marks : 10)

Marks

I Answer *all* questions in one or two sentences. Each question carries 2 marks.

1. Write the SI units of electric current and temperature.
2. What are collinear vectors ?
3. Define triangle law of vector addition.
4. State Hooke's law for elastic materials.
5. Give two applications of ultrasonic waves.

(5×2 = 10)

## PART — B

(Maximum marks : 30)

II Answer any *five* of the following questions. Each question carries 6 marks.

1. State and prove the law of conservation of linear momentum in the case of elastic collision in one dimension.
2. What are the rectangular components of a vector reacting at an angle  $\theta$  with the X axis ? If one of the rectangular components of a force 40 N is 20 N, find the other component.
3. A mass 5 kg is initially at rest. A force 20 N is applied on it. What is the kinetic energy at the end of 10 s ?
4. Two iron wires of the same radius have lengths in the ratio 1:3. They are subjected to forces in the ratio 2:1. Find the ratio of their elongations.
5. State Bernoulli's principle. Explain the lift of an air craft using Bernoulli's principle.
6. Explain various modes of vibration in an open pipe.
7. Show that the projection of a uniform circular motion along a diameter is simple harmonic.

(5×6 = 30)

## PART — C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

## UNIT — I

- III (a) Give the dimensions of velocity and acceleration. A ball is thrown vertically up. What is the velocity and acceleration at the top ? 3
- (b) Obtain an expression for the distance travelled by a particle during the  $n^{\text{th}}$  second of its motion. 6
- (c) A body is thrown vertically up from the top of a cliff with a velocity 98 m/s. It reaches the bottom of the cliff after 22 s. Find the height of the cliff. 6

OR

- IV (a) Show that impulse is equal to change in momentum. 3
- (b) State Newton's second law of motion. From the law obtain an expression for force. 6
- (c) A boy weighing 40 kg jumps upto a height 0.7m. Find his power if he can jump 20 times a minute. 6

## UNIT — II

- V (a) Define moment of a force. What is its unit ? 3
- (b) Obtain an expression for the work done by a rotating couple. 6
- (c) A couple 100 Nm acts on the shaft of a motor and rotates it at a speed 7 rev/s. Calculate the power developed. 6

OR

- VI (a) State and explain Lami's theorem. 3
- (b) What are coplanar forces ? Describe the condition for translational and rotational equilibrium of a body under coplanar parallel forces. 6
- (c) At the marks 30 cm, 45 cm and 86 cm of a meter scale of mass 0.5 kg, weights 1 kg, 2 kg and 3kg respectively are suspended. Where the scale should be suspended so that it remains horizontal ? 6

## UNIT — III

- VII (a) What are the energies associated with a streamline flow ? 3
- (b) Define the term viscosity. On what factors does the viscous force acting tangentially on a layer depend ? Discuss the variation of viscosity of liquids with temperature. 6
- (c) Calculate the viscous force on a water drop of radius 0.1mm falling through air of coefficient of viscosity  $1.8 \times 10^{-5}$  kg/m/s with constant velocity 0.15 m/s. 6

OR

- |  | Marks |
|--|-------|
| VIII (a) Define stress and strain. Give their units.   | 3     |
| (b) What is terminal velocity ? Using Stoke's formula, obtain an expression for the terminal velocity of a sphere falling through a viscous liquid.  | 6     |
| (c) Calculate the pressure required to maintain the flow of a liquid at the rate of 10 litre/s through a horizontal tube 10cm in diameter and 1km in length. Coefficient of viscosity of liquid = 0.001 SI unit. (1 litre = $10^{-3}m^3$ ) | 6     |

## UNIT — IV

- |   |   |
|---|---|
| IX (a) What is simple harmonic motion ? Give two examples of simple harmonic motion.  | 3 |
| (b) Discuss the resonance column experiment to determine the velocity of sound in air.  | 6 |
| (c) Velocity of sound in air at $0^{\circ}C$ is 330 m/s. Find the increase in velocity when the temperature is $1^{\circ}C$ . | 6 |

OR

- |  |   |
|--|---|
| X (a) Describe briefly a method for the production of ultrasonic waves.  | 3 |
| (b) Distinguish between free vibration and forced vibration. What is resonance ? When does it happen ?   | 6 |
| (c) The shortest length of an air column contained in a pipe closed at one end and resonating with a tuning fork 384 Hz is 22.1 cm. Calculate the velocity of sound. | 6 |

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
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ENGINEERING MATHEMATICS - I

[Time : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I Answer *all* questions. Each question carries 2 marks.

1. Find the value of  $\tan^2 60 + \tan^2 45$ .
2. If  $\tan \theta = 3$ , find  $\sin 2\theta$ .
3. Find the area of a triangle given,  $b = 3\text{cm}$ ,  $c = 2\text{cm}$  and  $A = 30^\circ$ .
4. Evaluate  $\lim_{x \rightarrow 3} \frac{x^2 + 9}{x + 3}$
5. For what values of  $x$ , the function  $x^2 - 3x + 6$  is increasing ?

(5×2 = 10)

PART — B

(Maximum marks : 30)

II Answer any *five* of the following questions. Each question carries 6 marks.

1. Find the value of  $\tan 75$ , without using tables and show that  $\tan 75 + \cot 75 = 4$ .
2. The horizontal distance between two towers is 60 m and the angle of depression of the first tower as seen from the second which is in 150 m height is  $30^\circ$ . Find the height of the first tower.
3. Prove that  $\cos \frac{\pi}{8} + \cos \frac{3\pi}{8} + \cos \frac{5\pi}{8} + \cos \frac{7\pi}{8} = 0$
4. Solve  $\Delta ABC$ , given  $a = 4\text{cm}$ ,  $b = 5\text{cm}$ ,  $c = 7\text{cm}$ .
5. Find the second derivative of  $x^2 \log x$ .
6. Differentiate 'sin  $x$ ' by the method of first principles.
7. If  $S$  denotes the displacement of a particle at the time ' $t$ ' seconds and  $S = t^3 - 6t^2 + 8t - 4$ .

(i) Find the time when the acceleration is  $12\text{cm/sec}^2$ .

(ii) The velocity at that time.

(5×6 = 30)

## PART — C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

## UNIT — I

- III (a) Prove that  $\frac{\operatorname{cosec}\theta}{\operatorname{cosec}\theta - 1} + \frac{\operatorname{cosec}\theta}{\operatorname{cosec}\theta + 1} = 2 \sec^2\theta$  5
- (b) If  $\tan A = 3/4$ ,  $\sin B = 5/13$ . (A lies in the third quadrant and B lies in the second quadrant.) Find  $\sin(A-B)$  and  $\cos(A+B)$ . 5
- (c) Evaluate  $\cos 570 \sin 510 - \sin 330 \cos 390$ . 5

OR

- IV (a) Prove that  $\frac{1 + \sin A}{\cos A} = \frac{\cos A}{1 - \sin A}$  5
- (b) Express  $\sqrt{3} \sin x + \cos x$  in the form of  $R \sin(x + \alpha)$  where  $\alpha$  is acute. 5
- (c) Prove that  $\sin(A+B) \sin(A-B) = \sin^2 A - \sin^2 B$ . 5

## UNIT — II

- V (a) Prove that  $\frac{\sin 3A - \sin A}{\cos 3A + \cos A} = \tan A$  5
- (b) Prove that  $\cos 80 \cos 60 \cos 40 \cos 20 = 1/16$  5
- (c) Show that  $a(b^2 + c^2) \cos A + b(c^2 + a^2) \cos B + c(a^2 + b^2) \cos C = 3abc$  5
- OR
- VI (a) Prove that  $\frac{\cot A - \tan A}{\cot A + \tan A} = \cos 2A$  5
- (b) Show that  $\sin 40 + \sin 80 + \sin 20 = 0$  5
- (c) Two angles of a triangular plot of land are  $53^\circ$  and  $67^\circ$  and the side between them is measured to be 100cm. How many meters of fencing is required to fence the plot? 5

## UNIT — III

- VII (a) Evaluate (i)  $\lim_{x \rightarrow \infty} \frac{3x+5}{x-2}$  (ii) Evaluate  $\lim_{x \rightarrow 3} \frac{x^2-9}{x-3}$  (3 + 2)
- (b) Find  $\frac{dy}{dx}$  if (i)  $x = at^2$ ,  $y = 2at$ . (3 + 2)
- (ii)  $y = \frac{\sin 2x}{1 + \cos 2x}$
- (c) If  $y = a \sin x + b \cos x$ . Prove that  $\frac{d^2y}{dx^2} + y = 0$  5

OR

- |   | Marks |
|---|-------|
| VIII (a) Find the derivative of 'sec x' using quotient rule.                              | 5     |
| (b) Find $\frac{dy}{dx}$ if (i) $y = \log(\sin\sqrt{x})$ (ii) $y = (x^3 + 3) \tan^{-1} x$ | (3+2) |
| (c) If $ax^2 + by^2 + 2gx + 2fy + c = 0$ , find $\frac{dy}{dx}$                           | 5     |

## UNIT — IV

- |   |   |
|---|---|
| IX (a) Find the equation to the tangent and normal to the curve $y = x^2 + 2x - 3$ at (2,5).  | 5 |
| (b) A circular plate of radius 3 inches expands when heated at the rate of 2 inches/second. Find the rate at which the area of the plate is increasing at the end of 3 seconds. | 5 |
| (c) The deflection of a beam is given by $y = 2x^3 - 9x^2 + 12x$ . Find the maximum deflection.   | 5 |

OR

- |  |   |
|--|---|
| X (a) Find the values of 'x' for which the tangent to the curve $y = \frac{x}{(1-x)^2}$ will be parallel to the x - axis.                                | 5 |
| (b) A balloon is spherical in shape. Gas is escaping from it at the rate of 10 cc/sec. How fast is the surface area shrinking when the radius is 15 cm ? | 5 |
| (c) The perimeter of a rectangle is 100 m. Find the sides when the area is maximum.  | 5 |

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2018

**ENGLISH FOR COMMUNICATION - I**

[Time : 3 hours

(Maximum marks : 100)

PART — A

	Marks
I Read the following excerpts and answer the questions that follow :	
1. "Because they were so alive," he said, and burst into tears.	
(a) Who burst into tears ?	1
(b) What is 'they' referred to here ?	2
(c) Describe the context.	4
2. Spaceships are crossing space among a million worlds. But we'll never join them. This is because of a silly mistake.	
(a) Identify the speaker.	1
(b) What was the silly mistake ?	2
(c) Explain the context.	4
3. With their shorts and their bright orange tee-shirts, / Their athletes are proud they are sent.	
(a) Who wears orange tee-shirts ?	1
(b) What are they participating in ?	2
(c) Comment on the context.	4
4. The beauty page gave some tips to a young lady to enhance her beauty.	
(a) To whom were these tips useful ?	1
(b) How did she use it ?	2
(c) Recall the context.	4

## PART — B

II 1. Fill up using the appropriate words given in brackets :

- (a) The magician waved his wand and the cards .....  
(punished, vanished, cherished)
- (b) The police pointed the ..... of the gun at the thief.  
(muzzle, drizzle, muscle)
- (c) Gold is ..... by jewellers.  
(astounded, messaged, assayed)
- (d) Gandhiji is the ..... of nonviolence.  
(editor, epitome, quantum)
- (e) Delhi is ..... for its polluted air.  
(notorious, desirous, captured)

(5×1 = 5)

2. Read the following sentences and find out the meaning of the words in bold letters from the context.

- (a) Most people feared the king because his punishments were **severe**.  
(simple, harsh, funny)
- (b) We can still reach the movie on time if we make **haste**.  
(fast, slow, food)
- (c) Ben became **weary** after studying continuously for twelve hours.  
(dressed, healthy, tired)
- (d) I became a vegetarian when I understood the **dreadful** treatment farm animals receive.  
(fearful, beautiful, careful)

(4×1 = 4)

3. Correct the errors in collocation and rewrite the sentences.

- (a) The Prime Minister made a visit to the President.
- (b) The grandmother spoke a story to the child.

(2×1 = 2)

4. (a) Write a synonym of the bold lettered word in the sentence.  
Benjamin is **brilliant** in maths.

- (b) Write the antonym of the bold lettered word in the sentence.  
Shafeeq thinks that this is a **complex** problem.

(2×1 = 2)

III 1. Rewrite the passage correcting the errors given in bold letters.

The mother took **a** child to the hospital **though** it was sick. After taking medicines there was **many** improvement. The mother told the doctor that he was the **better** doctor in the whole world.

(4×1 = 4)

2. Fill up in the blanks choosing the right words from the help box given.

Mohanlal is a ..... (polyester, popular) actor in Malayalam. He is known for his ..... (elegant, elected) style in portraying characters. He plays both ..... (jovial, journal) and ..... (magenta, majestic) roles with equal grace. Mohanlal enjoys a ..... (steady, study) growth in his acting career.

(5×1 = 5)

3. Describe the following picture in a paragraph. (60 words)



5

4. Rewrite the following passage correcting the errors.

Frank is **study** even at midnight because he **have** an exam tomorrow. Physics **are** a difficult subject for him. Therefore he **need** to spend more time. Frank **finish** studying in two hours and went to sleep.

5

5. Given below are three notices. Write down what they mean.

USE OTHER DOOR

SWITCH OFF MOBILES

PAY AND PARK

3

### PART — C

- IV Write two points in agreement and two points in disagreement with the topic for group discussion : Television is the Leading Cause of Violence.

4

- V Read the details of Ms. Kamala Nath.

Name : Kamala Nath  
 Lives in : Coimbatore  
 Education : Diploma in Polymer Technology  
 Additional Qualification : Certificate in Plastic Manufacture  
 Strengths : Sincere, punctual, motivated  
 Achievements : 1<sup>st</sup> in state level quiz competition  
 Hobbies : Trekking, swimming

Imagine that you are Kamala Nath and are going for an interview. How would you introduce yourself ? Prepare a self introduction.

5

- VI Prepare a resume in response to the advertisement given below in *The Employment News* of 18<sup>th</sup> February 2017.

MMTC Ltd. is India's largest public sector trading body. We are looking for young, vibrant and enterprising candidates for the post of Management Trainees. Candidates aged between 18 and 25 with Diploma in any discipline with good communication skills may send their applications to The HR Manager, MMTC Ltd., Lodhi Road, New Delhi.

5

- VII Complete the telephone conversation as directed.

Nandita : Hello Deepthi, ..... (requests help with project)

Deepthi : ..... (Agrees) ..... (Suggests to come to her home)

Nandita : ..... (Expresses thanks) ..... (Promises to come in the evening)

5

- VIII Write a paragraph on any one of the following.

(a) Cleanliness is next to Godliness.

OR

(b) Need for regular exercise.

6

- IX (a) Ishan is coming back from work. He meets Omar who invites to his home which is nearby. Construct a conversation. There should be a minimum of 6 exchanges.

OR

(b) The Factory Manager of Shakti Metals has decided to issue a memo to all employees to join the shift in time. Prepare the memo.

6

- X Chitra is participating in an environment seminar and wishes to make a presentation on disaster management. Prepare three slides using the information given below.

A disaster is a serious disruption that strikes the areas inhabited by man. It involves widespread destruction of human, material, environmental loss etc. Disasters can be classified as natural and man-made. Some of the natural disasters are landslides, hurricanes, wildfire, tornadoes, floods, earthquakes and tsunamis. Man-made disasters are disasters caused or induced by human activities. These include hazardous material emergencies like chemical spills and groundwater contamination, radiological emergencies, reservoir induced earthquake, nuclear leakage, terrorism, civil unrest and many more. Man-made disasters are equally dangerous as they pose great threat to both people and property. Disaster management is a very important process to reduce loss of life and property, and to provide rescue, relief, rehabilitation and recovery. It is creation of plans to reduce vulnerability to hazards and cope with disasters. It does not eliminate the disaster but tries to minimize its effect.

6

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
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**ENGINEERING CHEMISTRY - I**

[Time : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I Answer *all* questions in one or two sentences. Each question carries 2 marks.

1. What are nanomaterials and give two examples ?
2. What do you mean by conjugate acid - base pair according to Lowry-Bronsted concept ?
3. Give any two advantages of Reverse Osmosis.
4. What are the composition of cast iron and wrought iron ?
5. What are acid - base indicators ?

(5×2 = 10)

PART — B

(Maximum marks : 30)

II Answer any *five* of the following questions. Each question carries 6 marks.

1. (a) Bleaching powder is used for the sterilization of water. Give the chemical changes involved in sterilization of water by bleaching powder.  
(b) Write any three characteristics of potable water.
2. (a) Calculate the number of electrons, protons and neutrons of the following.  
(i)  ${}^{14}_7\text{N}$                       (ii)  ${}^{35}_{17}\text{Cl}$   
(b) Write any three properties of carbon nanotubes.
3. (a) What is meant by equivalent weight of an acid and give its mathematical expression.  
(b) Calculate the molarity of  $\text{HNO}_3$  which contains 1.57 gm per 100ml (atomic weight of H = 1, N = 14, O = 16).

4. (a) Why soap does not lather easily in hard water ?  
 (b) Give the block diagram for the production of potable water with all necessary details.
5. (a) Write three limitations of powder metallurgy.  
 (b) Which are the three varieties of Iron and Compare their magnetization property.
6. (a) Explain acidic and basic buffer with one example each.  
 (b) Define ionic product of water. Give its mathematical expression.
7. (a) Write any three differences between atom and molecule.  
 (b) Give the percentage composition and any two uses of Duralumin. (5×6 = 30)

## PART — C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

## UNIT — I

- III (a) Explain any two methods of synthesis of carbon nanotubes. 6  
 (b) What are fundamental particles ? Write their charge and mass. 5  
 (c) Give any four applications of nanomaterials in medical field. 4

OR

- IV (a) Explain homogeneous and heterogeneous catalysis with two examples each. 6  
 (b) Explain catalytic promoter and poison with one example each. 5  
 (c) What are carbon nanotubes and mention different varieties of carbon nanotubes. 4

## UNIT — II

- V (a) Explain the following concepts of acids and bases with two examples for each.  
 (i) Arrhenius concept  
 (ii) Lewis concept 6  
 (b) Which acid base indicators are used in the following titrations ? Justify your answer.  
 (i) Oxalic acid × Sodium hydroxide  
 (ii) Hydrochloric acid × Sodium carbonate 5  
 (c) Define normality of a solution. Calculate the normality of sulphuric acid solution, if 1.96gm  $H_2SO_4$  is present in 500ml of solution.  
 (Atomic weight of H = 1, S = 32, O = 16). 4

OR

- VI (a) (i) What is pH scale ?  
 (ii) A solution is prepared by dissolving 5.6gm of KOH in 500ml of solution.  
 What is the pH of solution ? (K = 39, O = 16, H = 1) 6
- (b) Write short notes on :  
 (i) Standard solution (ii) Buffer capacity 5
- (c) Write any four applications of pH. 4

## UNIT — III

- VII (a) What is the cause of temporary hardness of water ? Explain two methods to remove temporary hardness. 6
- (b) Explain the various steps involved in the production of potable water. 5
- (c) Write any four physical properties of water. 4

OR

- VIII (a) (i) Explain ion exchange method for the removal of permanent hardness of water. 6  
 (ii) What do you mean by regeneration of ion exchange resins ? 6
- (b) What is desalination of sea water ? Explain any one method for desalination of sea water. 5
- (c) Distinguish between hard water and soft water. 4

## UNIT — IV

- IX (a) Explain the following methods of heat treatment of steel.  
 (i) Annealing  
 (ii) Hardening  
 (iii) Tempering 6
- (b) Write any five advantages of powder metallurgy. 5
- (c) Write any four physical properties of metals. 4

OR

- X (a) What is powder metallurgy ? Explain different steps involved in powder metallurgy. 6
- (b) What is an alloy ? Explain preparation of alloys by fusion method with the help of diagram. 5
- (c) Name any two impurities of steel and give their effects on its properties. 4