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2E2005

2E2005

B. Tech. I Year II Sem. (Back) Exam., May– 2018
Common to All Branch
205 Engineering Mechanics

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

*Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL _____   2. NIL _____

UNIT-I

Q.1 (a) State and prove Lami's theorem.   [4]

(b) State and prove Law of Parallelogram of forces.   [6]

(c) A string of 24 cm length is attached to a point on a smooth vertical wall and another point on the surface of a sphere whose diameter is 24 cm and weight is 100kN. The sphere rests on the wall in equilibrium condition. Find the tension in the string and the reaction of the wall to the sphere at the point of contact.   [6]

OR

Q.1 (a) By the principle of virtual work, find the values of reactions at A and B.   [6]
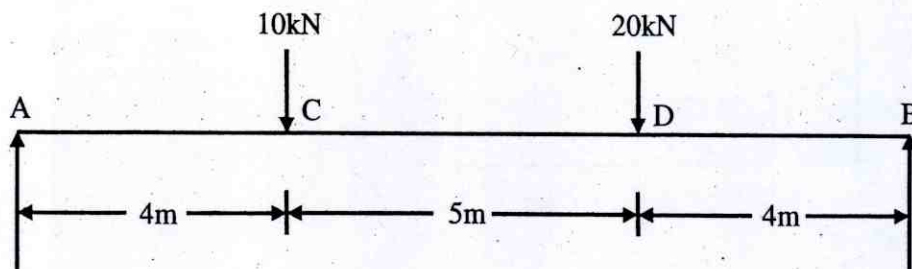
(b) Five forces 4, $\sqrt{3}$, 5 , $\sqrt{3}$ and 3kN respectively act at one of the angular points of a regular hexagon towards other five angular points. Find the magnitude and direction of the resultant forces.   [10]

UNIT-II

Q.2 (a) What is pulley? State the working of third system of pulleys. Derive relations for mechanical advantage, velocity ratio and efficiency of the system.   [6]

(b) What load will be lifted by an effort of 12 N, if the velocity ratio is 18 and efficiency of the machine at this load is 60%? If the machine has a constant friction resistance, determine the law of machine and find the effort required to run this machine at   [10]

   (i)   no load and

   (ii)   a load of 900 N.

OR

Q.2 Find the moment of inertia of the following fig. about XX and YY axis.   [16]
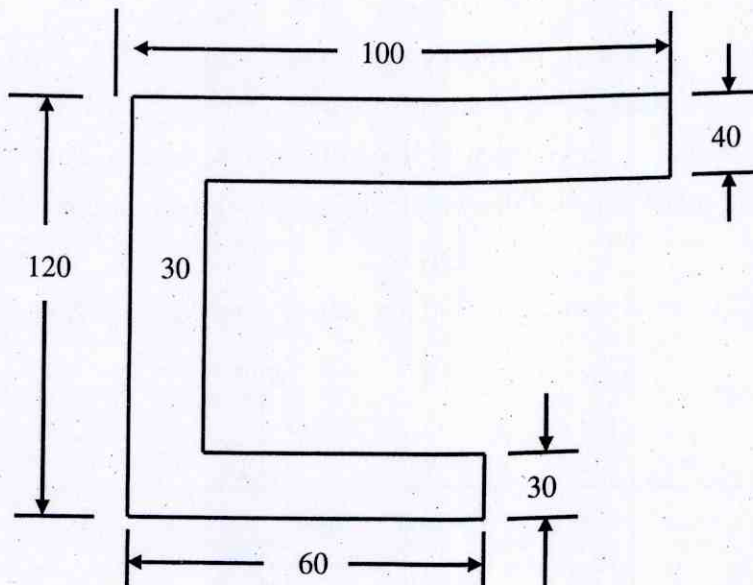
UNIT-III

Q.3 (a) Explain different types of friction. State different laws of static and dynamic friction. [6]

(b) A ladder 5 meters long rests on a horizontal ground and leans against a smooth vertical wall at an angle of 70° with the horizontal. The weight of the ladder is 900 N. The ladder is at the point of sliding, when a man weighing 750N stands on a rung 1.5 meter from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the floor. [10]

OR

Q.3 (a) Derive the relation between ratio of tensions for an open belt drive. [6]

(b) A shaft rotating at 200 rpm drive another shaft at 300 rpm and transmits 6kW through a belt. The belt is 100 mm wide and 10 mm thick. The distance between the shafts is 4m and the smaller pulley is 0.5m in diameter. Find the tensions in the belt. [10]

UNIT-IV

Q.4 (a) Derive a relation for the velocity and direction of motion of a projectile: [6]

(i) After a given interval of time t from the instant of projection.

(ii) At a given height h above the point of projection.

(b) A particle is thrown with a velocity of 5 m/s at an elevation of 60° to the horizontal. Find the velocity of another particle thrown at an elevation of 45° which will have : [10]

(i) Equal horizontal range

(ii) Equal maximum height

(iii) Equal time of flight

OR

Q.4 (a) State the laws of motion. Discuss the first law in the light of second law. [6]

(b) A bullet of mass 20gm is fired horizontally with a velocity of 300 m/s, from a gun carried in a carriage; which together with the gun has mass of 100 kg. The resistance to sliding of the carriage over the ice on which it rests is 20N. Find:-

(i) Velocity with which the gun will recoil

(ii) Distance in which it comes to rest

(iii) Time taken to do so. [10]

UNIT-V

Q.5 (a) State and prove the law of conservation of energy. [6]

(b) An engine of mass 50 tonnes pulls a train of mass of 250 tonnes up a gradient of 1 in 125 with a uniform speed 36km/hr. Find the power transmitted by the engine, if the tractive resistance is 60 newtons per tonnes. Also find the power transmitted by the engine, if the acceleration of the engine is 0.2m/s^2 up the gradient. [10]

OR

Q.5 (a) What do you know about impulse and momentum? Explain with the help of any example and also state the impulse momentum relation. [6]

(b) Two balls of mass 3kg and 6kg are moving with velocities of 2.5m/s and 5m/s respectively towards each other. If the coefficient of restitution is 0.5, find the velocities of the balls after impact. [10]

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2E2307

2E2307
B. Tech. II Sem. (Main) Exam., May – 2018
OE -101 Engineering Mechanics

Time: 3 Hours
Maximum Marks: 80
Min. Passing Marks: 28

Instructions to Candidates:
*Attempt any **five questions** including Question No. 1, which is Compulsory.*
*All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used/calculated must be stated clearly.
Use of following supporting material is permitted during examination.
(Mentioned in form No.205)

1. NIL _____   2. NIL _____

Q.1 COMPULSORY,

Answers for each sub-question be given in about 25 words.   [8×2=16]

(a) The resultant of two forces P and Q is at right angle to P. Show that the angle between the forces is $\cos^{-1}$ (-P/Q)

(b) What is meant by an axis/plane of symmetry of a body in the context of centroid/ centre of gravity?

(c) Mention the forces which are generally omitted while applying the principle of virtual work.

(d) What is cone friction? State its significance

(e) Two cars are moving in the same direction with a speed of 45km/hr and a distance of 10km separates them. A car coming from opposite direction meets these two cars at an interval of 6 min. Determine the speed of this car.

(f) A cricket ball of mass 175gm is moving with a speed of 36km/hr. What average force will be required to stop the ball in 0.2 seconds?

(g) Determine the force necessary to produce an acceleration of 4 m/s^2 in a mass of 250kg.

(h) Differentiate between scalar and vector quantities. How a vector quantity is represented?

Q.2 (a) What is free body diagram? Explain with the help of suitable example with neat sketch. [4]

(b) Find the Moment of Inertia of a given figure about centroidal axis. [12]
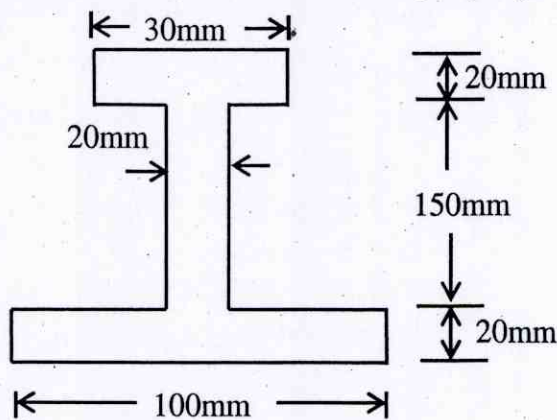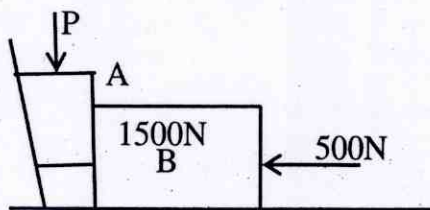

(figure not in scale)

Q.3 (a) State the principle of virtual work, and explain how it can be used for solving problems in statics. [6]

(b) A uniform ladder of weight 250N rests against a smooth vertical wall and a rough horizontal floor making an angle of 45° with horizontal. Find the forces of friction at floor using principle of virtual work. [10]

Q.4 Determine the force P required to start the wedge shown in sketch. [8]

The angle of limiting friction for all surfaces of contact is 15° (μ = tan 15°)

(b) Find the resultant of given force system and also find its direction. [8]
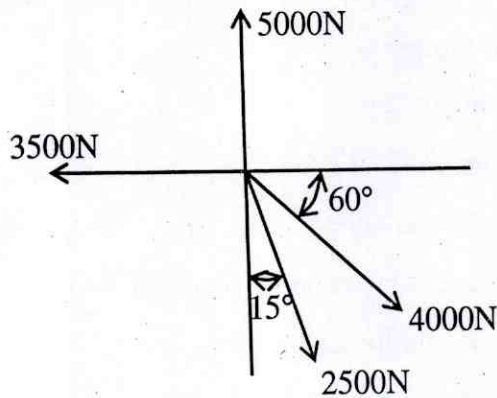
(Figure not in scale)

Q.5 (a) A train started from rest and accelerated. The acceleration at any instant is given by $\left(\dfrac{7}{V}+2\right)$ m/s² ,where V is the velocity of train in m/s. at given instant. Find the distance in which train will attain a velocity of 60km/hr. [8]

(b) Two balls are projected from the same point in direction inclined at 60° and 30° with horizontal. Calculate the ratio of their velocities of projection if: [8]

   (i) The ball attain the same height (max.)
   (ii) The range are equal for balls

Q.6 (a) Define D'Alembert principle and Newton's Law of gravitation. [6]

(b) A 750N crate rests on a 500N cart. The coefficient of friction between crate and cart is 0.3 and between cart and road is 0.2. If the cart is to be pulled by a force F (shown in sketch), such that crate does not slip. Determine: [10]

   (i) Max. Allowable magnitude of force F
   (ii) The corresponding acceleration of cart.
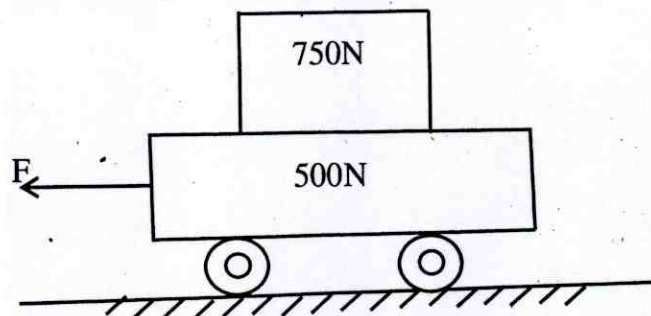
Q.7 (a) State and prove the law of Conservation of Energy. (Draw neat sketch also) [8]

(b) A ball of mass 6kg is dropped from a height of 12cm on a spring of stiffness 510 N/m. The maximum deflection of the spring is? [8]

Q.8 (a) Explain linear and angular momentum. [3]

(b) Write the impulse- momentum equation and mention its application. [3]

(c) Two bodies weighing 300N and 450N are hung to the ends of a rope passing over on Ideal pulley. With what acceleration would the heavier body come down? What is the tension in rope? Obtain solution by using: [10]

(i) The principle of work and energy.

OR

(ii) Principle of Impulse and Momentum.

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2E1026

B. Tech. II Sem. (Back) Exam., May – 2018

Common to All Branches of Engineering

203/103 Engineering Chemistry

Time: 3 Hours   Maximum Marks: 80
                                                 Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL _____   2. NIL _____

UNIT-I

Q.1 (a) What are the characteristics of a good fuel? Give classification of coal and

explain each class with example   [3+5=8]

(b) Describe fractional distillation method of petroleum refining   [8]

OR

Q.1 Write informative notes on any two of the following: [8+8=16]

(a) Carbonization of coal

(b) Synthetic petrol by Bergius process

(c) Oil gas

(d) Knocking in engines and used antiknock compounds.

UNIT-II

Q.2 (a) What is Proximate Analysis of coal? Discuss the significance and procedure of proximate analysis. [10]

(b) A sample of coal was found to contain the following ,C = 80%, H = 5%, O = 1%, N = 2%, Ash = 12%, Calculate the amount of air required for complete combustion of 1 kg of sample. [6]

OR

Q.2 (a) Describe flue gas analysis by Orsat Apparatus. [8]

(b) A sample of coal on analysis have following compositions ,C = 75%, H = 10%, O = 5%, S = 4.5%, N = 2% and Ash = 3.5%. Calculate the gross and net calorific value of coal sample. [8]

UNIT-III

Q.3 What is Phase Rule? Explain sulphur system with a labeled phase diagram. [16]

OR

Q.3 Answer any two of the following: [8+8=16]

(a) Reduced phase rule for Bi-Cd system

(b) Metastable state in water system

(c) Triple point and eutectic point

(d) Calculate the number of components and phases in the following:

   (i) H_2O (s) $\rightleftarrows$ H_2O (ℓ) $\rightleftarrows$ H_2O (g)

   (ii) $CaCO_3$ (s) $\rightleftarrows$ CaO (s) + CO_2 (g)

UNIT-IV

Q.4 What are optical fibers? Describe the construction, working and uses of optical fibers. [16]

OR

Q.4 (a) Explain how conductivity is induced in organic polymers? [8]

(b) What is superconductivity? Explain Meissner effect in superconductors. [8]

UNIT-V

Q.5 (a) Explain the mechanism of dry corrosion. [8]

(b) Describe different types of protective coatings. [8]

OR

Q.5 Write short notes on the following:

(a) Galvanic corrosion [4]

(b) Water-line corrosion [4]

(c) Cathodic protection [4]

(d) Importance of design selection in controlling corrosion [4]

2E2004

2E2004

B. Tech. I Year II Sem. (Back) Exam., May – 2018
204 Chemistry & Environmental Engineering

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL _____   2. NIL _____

UNIT-I

Q.1 (a)   What is degree of hardness? Discuss the complexometric method for determining hardness of water.   [2+8=10]

(b)   A standard hard water solution was prepared by dissolving 300 mg of dry $CaCO_3$ in 1000ml. of distilled water.14.2 ml. of soap solution was consumed when treated with 20ml. of SHW. Lather factor for 20ml. of distilled water is 0.4ml. The 20ml of sample water consumed 8.2ml. of soap solution.6.2ml. of soap solution was consumed, when treated with 20ml of boiled water. Calculate total, permanent and temporary hardness.   [6]

OR

Q.1 (a)   What is break point chlorination? Explain with diagram. Write the advantages of breakpoint chlorination.   [6]

(b)   What are the requisites of drinking water? Explain the various steps involved in purification of water.   [2+8=10]

UNIT-II

Q.2 (a) Calculate the amount of Lime and soda needed for softening 20,000 litres of water containing the following: [6]

$Al_2 (SO_4)_3$ = 64.2 mg/L

$MgCl_2$ = 10.5 mg/L

NaCl = 30mg/L

HCL = 8.2 mg/L

Purity of Lime is 90% and that of soda is 98%. 10% chemicals are used in excess in order to complete the reaction quickly.

(b) Write short notes on: [2×5=10]

(i) Boiler corrosion

(ii) Zeolite method

OR

Q.2 (a) Discuss the Lime-Soda process for softening hard water. [8]

(b) Give comparison between Lime-soda and Zeolite method. [4]

(c) Explain Caustic Embrittlement. [4]

UNIT-III

Q.3 (a) What is Ecosystem? Explain various types of ecosystem and components with examples. [8]

(b) What is biodiversity? Explain levels and basic law of biodiversity. [2+6=8]

OR

Q.3 (a) Explain : Oxygen cycle. [6]

(b) What is Environmental Impact Assessment? Describe its necessity and methodology. [2+2+6=10]

UNIT-IV

Q.4 (a) What is solid waste management? Discuss the steps involved in SWM practice. Give the classification of solid waste. [2+6+2=10]

(b) Write short notes on- [2×3=6]

(i) Green House effect and Global warming

(ii) Acid Rain

OR

Q.4 (a) Describe ozone depletion, its harmful effects and causes of ozone depletion. How the ozone depletion can be prevented? [8]

(b) What is noise pollution? What are adverse effects of noise pollution on human being? [8]

UNIT-V

Q.5 Write short notes on- [4×4=16]

(a) Pitting corrosion

(b) Sedimentation

(c) Domestic waste water treatment

(d) Factors influencing corrosion

OR

Q.5 (a) What is corrosion? Explain rusting of iron with the help of electrochemical theory of corrosion. [2+6=8]

(b) What are common impurities present in surface water? Discuss the effect of impurities on mankind. [4+4=8]

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1E2202

B. Tech. II Sem. (Main) Exam., May – 2018
HU-101 Communication Skills

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 28

Instructions to Candidates:

*Attempt any **five questions** including Question No. 1, which is Compulsory. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL _____   2. NIL _____

Q.1 COMPULSORY

Answers for each sub-question be given in about 25 words.   [8×2=16]

(a)   What are the important elements of cycle of communication?

(b)   Write the advantages of written communication.

(c)   What are the various media of communication?

(d)   What do you mean by linking words? Give examples.

(e)   Enlist various types of reports.

(f)   Mention various types of business letters.

(g)   Where did the lady want to have luncheon? What kind of a restaurant was it?

(h)   Write the central idea of the Poem 'Where the Mind is without fear' by Rabindranath Tagore.

Q.2 Do as directed: [4×4=16]

(a) Change into Passive voice:

(i) They will have completed the project before the deadline.

(ii) Was he reading a book?

(iii) The child can throw the stone.

(iv) Bring the answer sheet.

(b) Change into indirect speech:

(i) Madhuri says, "I am not feeling well today."

(ii) The teacher said to the students, "Go and stand there."

(iii) He said, "I've been waiting for ages."

(iv) Mother said to the child, "What do you want?"

(c) Insert suitable modals:

(i) Mrs. Becky is amazing, she...... ... speak seven languages including Japanese. (Ability)

(ii) You ....not lose any more weight. You are already slim. (Necessity)

(iii) Mr. Bob ....sell his farm house. (Remote possibility)

(iv) Cars .... not be parked in front of the gate. (Prohibition)

(d) Complete the conditional sentences by inserting suitable verbs:

(i) I........... (earn) a lot of money if I get that job.

(ii) If Maria .... (work) hard she would have been top in her class.

(iii) Would you mind if I .... (open) the window?

(iv) The salad .... (taste) better if you added some garlic.

Q.3 (a) You have received three boxes of switches and sockets from Delta Technologies, Bengaluru. Items are insufficient and damaged. Write a letter of complaint to replace and send sufficient, undamaged and fresh switches and sockets. [8]

(b) Draft the reply of above complaint. [8]

Q.4 Discuss in detail the barriers to communication and how to overcome the barriers to communication. [12+4=16]

Q.5 Describe – (any two) [2×8=16]

(a) Format of project report.

(b) Non verbal communication

(c) Qualities of good communication

(d) Use of irony and humour in 'The Luncheon'

Q.6 (a) Give brief description of the station and the girl selling baskets at the Deoli station in the story 'The Night Train at Deoli Station'. [8]

(b) Write the summary of the story "How Much Land Does a Man Need?" by Leo Tolstoy. [8]

Q.7 (a) What is the purpose of the poem 'If'? What are the essentials of manhood discussed in the poem 'If' by Kipling? [8]

(b) The poem "No Men are Foreign" is the best example of universal brotherhood. Discuss. [8]

Roll No. _____   Total No of Pages: 2

1E2203

1E2203

B. Tech. II Sem. (Main) Exam., May – 2018

HU-103 Human Values

Time: 3 Hours   **Maximum Marks: 80**
Min. Passing Marks: 28

Instructions to Candidates:
    Attempt any five questions including Question No. 1, which is Compulsory.
    All questions carry equal marks. Schematic diagrams must be shown wherever
    necessary. Any data you feel missing suitably be assumed and stated clearly.
    Units of quantities used/calculated must be stated clearly.
    Use of following supporting material is permitted during examination.
    (Mentioned in form No.205)

1. NIL _____   2. NIL _____

Q.1 Compulsory, Answers for each sub-question be given in about 25 words.   [8×2=16]

    (a) What is meant by human values?

    (b) What do you understand by the terms Swatva, Swatantrata and Swarajya?

    (c) What is Sanyam?

    (d) Define existence.

    (e) List the values included in human relationship.

    (f) Name and define all the four orders of nature.

    (g) Define humanistic universal order.

    (h) What do you understand by self-exploration?

Q.2 "Process of self-exploration leads to realisation and understanding". Explain.   [16]

Q.3 "The state of harmony or lack of it in the self has a strong influence on the health of

the body". Explain.   [16]

Q.4 What are the fundamental values of relationship? How can they be used to ensure

strong and mutually fulfilling relationship? Explain.   [16]

Q.5 Harmony in the family is the building block for harmony in the society. Comment [16]

Q.6 What do you mean by comprehensive human goal? Explain. How is it related to your

goal in life?   [16]

Q.7 "The problem today is that the desires, thoughts and expectations are largely set by

pre-conditioning or sensations". Examine this statement.   [16]

Roll No. _____		Total No of Pages: 2

2E2001

2E2001

B. Tech. II Sem. (Back) Exam., May – 2018
Common to All Branch
201 Communication Techniques

Time: 3 Hours
Maximum Marks: 80
Min. Passing Marks: 26

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL _____   2. NIL _____

UNIT-I

Q.1 Define Communication and explain the meaning, importance and process of communication in detail.   [16]

OR

Q.1 What are the different types of Communication? Explain Objectives of Communication giving suitable examples.   [16]

UNIT-II

Q.2 Distinguish between Formal and Informal Channels of Communication in detail.   [16]

OR

Q.2 Explain the qualities of Good Communication. What role does professional communication play in an engineer's life?   [16]

UNIT-III

Q.3 What do you know about Inter-Personal Communication? Suggest methods to improve it. [16]

OR

Q.3 Explain Barriers to Communication mentioning ways to overcome them. [16]

UNIT-IV

Q.4 Explain Subject Verb Agreement giving suitable examples. [16]

OR

Q.4 Describe Active and Passive Voice. Give the rules for the conversion of Active voice to Passive Voice. [16]

UNIT-V

Q.5 Apply for the post of junior engineer. Draft a detailed Bio data, inventing all relevant information. [16]

OR

Q.5 Write a detailed report on the Cultural Fest organized in your college. [16]

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2E2305

2E2305
B. Tech. II Sem. (Main) Exam., May – 2018
CE -103 Basic Civil Engineering

Time: 3 Hours   **Maximum Marks: 80**
Min. Passing Marks: 28

Instructions to Candidates:
*Attempt any **five questions** including Question No. 1, which is Compulsory.*
*All questions carry **equal** marks. Schematic diagrams must be shown wherever*
necessary. Any data you feel missing suitably be assumed and stated clearly.
Units of quantities used/calculated must be stated clearly.
Use of following supporting material is permitted during examination.
(Mentioned in form No.205)

1. <u>NIL</u>   2. <u>NIL</u>

Q.1 Compulsory, Answers for each sub-question be given in about 25 words.   [8×2=16]

     (a)   What is the object of surveying?

     (b)   What is Representative fraction?

     (c)   Explain the indirect ranging?

     (d)   What is Magnetic declination?

     (e)   Explain the height of instrument?

     (f)   Define the floor space index?

     (g)   What is the main function of alumina in brick?

     (h)   What is the initial setting time for ordinary portland cement as per IS

          specifications?

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Q.2 (a) What is local attraction? How is it detected and eliminated? [8]

(b) The length of a line measured with a 20 meter chain was found to be 250 meters.

Calculate the true length of the line, if the chain was 10 cm too long? [4]

(c) Write a short note on total station. [4]

Q.3 (a) Explain the importance of a Civil Engineer in society? [8]

(b) What are the various uses of stones? [4]

(c) Mention the uses of cement. [4]

Q.4 (a) What should be the planning for proper sunlight and ventilation in a

building? [8]

(b) Explain the basic concept of R.C.C.? [4]

(c) Write the components of a building. [4]

Q.5 (a) Explain the various road traffic signs. [8]

(b) Define levelling. Explain spirit levelling. [4]

(c) Write a short note on building bye-laws? [4]

Q.6 (a) Explain ranging out survey lines. [8]

(b) What are the impacts of infrastructural development on economy of country? [4]

(c) What are the qualities of good bricks? [4]

Q.7 (a) Write the characteristics of various modes of transportation. [8]

(b) What are the basic systems of notation of bearings? [4]

(c) Write a short note on road safety measures. [4]

Roll No. _____ Total No of Pages: 3

1E2204

1E2204

B. Tech. II Sem. (Main) Exam., May – 2018
PY-101 Engineering Physics

Time: 3 Hours   Maximum Marks: 80
                                                 Min. Passing Marks: 28

Instructions to Candidates:

Attempt any *five questions* including Question No. 1, which is Compulsory.
All questions carry *equal* marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.
Units of quantities used/calculated must be stated clearly.
Use *of following supporting material is permitted during examination.*
(Mentioned in form No.205)

1. <u>NIL</u> _____   2. <u>NIL</u> _____

Q.1 Compulsory   [8×2=16]

Answers for each sub-question be given in about 25 words -

(a) What is the shape and name of fringes in wedge shaped thin film?

(b) What is the condition to get missing spectra in plane transmission grating? Write its expression.

(c) State Law of Malus.

(d) What is Hall Effect? Write expression for Hall coefficient.

(e) Explain the presence of unmodified radiation in Compton scattering.

(f) Give the reason for high intensity of a laser.

(g) What are the differences between holography and photography?

(h) What is the physical meaning of numerical aperture of an optical fiber?

Q.2 (a) Draw labeled diagram of a Michelson's Interferometer. How shall we use it to measure wavelength of a monochromatic source of light? Explain the role of compensating glass plate in Michelson's Interferometer. [6]

(b) What is the working principle of anti-reflection coating? Derive an expression for refractive index of coating material & its thickness. Describe various applications of anti-reflection coating. [6]

(c) In Michelson's Interferometer the reading of a pair of maximum distinctness were found to be 0.6989 mm and 0.9334 mm. If mean wavelength of the doublet used is 5893 $\overset{o}{A}$, find the difference between wavelengths of components. [4]

Q.3 (a) Explain Rayleigh's criterion of resolution. What is meant by resolving power of a grating? Derive an expression for resolving power of grating & on what factor does it depend? [8]

(b) How will you distinguish between, [4]

(i) PPPL & EPL and

(ii) EPL & CPL

(c) 80 gm of impure sugar when dissolved in a litre of water gives an optical rotation of 9.8°, when placed in a tube of length 200mm. If specific rotation of sugar is 66° /dm (gm/cc), find the percentage purity of sugar sample. [4]

Q.4 (a) Describe nature and origin of various forces existing between atoms of solid crystals. Explain the formation of covalent, ionic and metallic bonding in solids [6]

(b) What is X-ray diffraction? Deduce Bragg's Law for the diffraction of X-ray in a crystal, how Bragg's spectrometer is used to determine the wavelength of monochromatic X-rays? [6]

(c) Assuming that there are 5×10^{28} atoms/m^3 in copper, find the Hall coefficient. [4]

Q.5 (a) Obtain an expression for shift in wavelength of scattered photon by Compton scattering and show that Compton shift depends only on scattering angle. [8]

(b) Write down the Schrödinger's time independent wave equation for a free particle confined in a one dimensional box of size 'a'. Obtain Eigen values and normalized wave function for this particle. [8]

Q.6 (a) What do you mean by the word coherence? Explain temporal and spatial coherence. Give example of one experiment each which demonstrate temporal and spatial coherence. [6]

(b) The distance between a monochromatic source of light and a double slit is 2 meter. The wavelength of light is 6×10^{-7} m. The separation of S_1 S_2 is 2 mm. What should be the size of the source of light so that spatial coherence is maintained between S_1 & S_2? [4]

(c) Show that the numerical aperture of a step index fiber is given by $N.A = n_1\sqrt{2\Delta}$, where symbol have their usual meaning? [6]

Q.7 (a) Describe the construction and working of He-Ne laser. What is the role of He? Give some important applications of this laser. [8]

(b) Discuss the construction of hologram and reproduction of image from a hologram. In brief, discuss applications of a hologram. [8]

Time: 3 Hours   **Maximum Marks: 80**
                                                     Min. Passing Marks: 26

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL _____   2. NIL _____

UNIT-I

Q.1 (a) Derive Schrodinger's time dependent wave equation. Explain the followings: [4+4+4=12]

  (i)   Physical significance of wave function.

  (ii) Normalized and Orthogonal wave functions.

  (b) An X – ray photon is found to have doubled its wavelength on being scattered by 90°. Find the energy and wavelength of incident photon.   [4]

OR

Q.1 (a) What is Compton Effect? Derive an expression for Compton-Shift and wavelength of scattered photon. Explain why the Compton Shift is not observed with visible light.   [8]

(b) X – ray with $\lambda = 1A°$ are scattered from a carbon block, the scattered radiation is viewed at 90° to the incident beam [8]

(i) what is the Compton Shift?

(ii) what Kinetic energy is important to the recoiling electron?

UNIT-II

Q.2 (a) What is tunnel effect? Write down Schrodinger equation for potential barrier problem and steps to find out the transmission coefficient of a particle having less energy than the height of potential barrier. [8]

(b) Calculate Fermi energy in copper assuming that each copper atom contributes one free electron to the electron gas. Given density of copper is $8.94\times10^3 kg/m^3$ and atomic mass is 63.5u. [8]

OR

Q.2 (a) Write a short note on quantum mechanical tunneling. [4]

(b) Write a short note on Sommerfeld's free electron gas model. [4]

(c) Consider an electron whose total energy is 5eV approaching a barrier whose height is 6eV and width is 7A°. Find out the de–Broglie wavelength of incident electron and probability of transmission through barrier (Mass of electron = 9.1×10^{-31}kg), Planck's constant = 6.6×10^{-34}J–s. [8]

UNIT-III

Q.3 (a) What is an Optical Fiber? What do you mean by numerical aperture of an optical fiber? Find an expression for the numerical aperture of a step index optical fiber? [8]

(b) Explain in brief the terms: [8]

(i) Temporal coherence

(ii) Spatial coherence

OR

Q.3 (a) Show that visibility is a measure of coherence. Can there be absolute coherence or absolute incoherence? [6]

(b) What is the coherence length of a Source of wavelength 6750A° with a bandwidth of 0.4A°. [4]

(c) Calculate the numerical aperture, acceptance angle and the critical angle of fiber having core refractive index = 1.50 and the cladding refractive index = 1.45. [6]

UNIT-IV

Q.4 (a) Outline basic theory of holography? [8]

(b) Explain the construction and working of He – Ne laser. Draw necessary diagram. What is the role of He in this laser. [8]

Part IV

OR

Q.4 (a) Compare holography and photography and discuss the construction and reproduction of a hologram. In brief discuss application of a hologram. [8]

(b) Describe the Principle, Construction and Working of a Semiconductor laser. Describe various application of Semiconductor laser. [8]

UNIT-V

Q.5 (a) Give the Construction, working and application of Scintillation Counter. [8]

(b) The efficiency of a GM Counter is 80%, if it counts maximum 6000 counts/ minute, then calculate the paralysis time of Counter. [8]

OR

Q.5 (a) Describe Construction and working of Geiger–Muller Counter. Explain the terms, dead time and quenching. [8]

(b) What are the advantages of Proportional Counter over GM Counter? [8]

Roll No. _____

Total No of Pages: 3

1E2205

1E2205

B. Tech. II Sem. (Main) Exam., May – 2018

CY-101 Engineering Chemistry

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 28

Instructions to Candidates:

Attempt any five questions including Question No. 1, which is Compulsory.
All questions carry equal marks. Schematic diagrams must be shown wherever
necessary. Any data you feel missing suitably be assumed and stated clearly.
Units of quantities used/calculated must be stated clearly.
Use of following supporting material is permitted during examination.
(Mentioned in form No.205)

1. NIL _____   2. NIL _____

Q.1 COMPULSORY

Answers for each sub–question be given in about 25 words.   [8×2=16]

(a) Explain scale and sludge formation.

(b) What is meant by the term cracking?

(c) Arrange n–octane, naphthalene, iso-octane in increasing order of their knocking tendency.

(d) Define degree of polymerization.

(e) What is meant by thermal Spalling?

(f) Discuss four essential properties of a good refractory.

(g) Write the name and composition of Portland cement.

(h) Define the term lubricant and mention their important functions.

Q.2 (a) Discuss the treatment of ground water to be used for domestic purposes. [8]

(b) What is softening of water? Explain the softening of water by Zeolite method with diagram and chemical reaction. [8]

Q.3 (a) How gross calorific value of a solid fuel is determined by Bomb Calorimeter. [8]

(b) What is water gas and its composition? How it is prepared on industrial scale? Explain its uses. [8]

Q.4 (a) A sample of water having the following analysis:– [8]

$Mg(HCO_3)_2$ = 73 mg/L ; $Ca(HCO_3)_2$ = 162 mg/L

$CaSO_4$ = 136 mg/L ; $CaCl_2$ = 111 mg/L

$MgCl_2$ = 95 mg/L ; $NaCl$ = 58.5 mg/L

Calculate the temporary, permanent & total hardness of water in terms of Clark degree.

(b) Calculate the weight of air needed for complete combustion of 5.0 kg of a coal containing 80% carbon, 15% hydrogen and rest is oxygen. [8]

Q.5 (a) Explain the mechanism of fluid and boundary lubrication. [8]

(b) (i) Explain the importance of "timing" in corrosion control. [4]

(ii) Why iron pipe is galvanized? [4]

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Q.6 Describe with a neat diagram how Portland Cement is manufactured by wet process.

Explain chemical reaction involved in the process. [16]

Q.7 (a) Classify various types of glass and write short notes on:– [8]

(i) Borosilicate glass

(ii) Alumino silicate glass

(iii) Optical glass

(b) Write short notes on:– [4+4=8]

(i) Seger Cone Test

(ii) R.U.L Test

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2E2304

2E2304

B. Tech. II Sem. (Main) Exam., May – 2018

EE -101 Basic Electrical & Electronics Engineering

Time: 3 Hours   **Maximum Marks: 80**
                                                    Min. Passing Marks: 28

Instructions to Candidates:
  *Attempt any **five questions** including Question No. 1, which is Compulsory.*
  *All questions carry **equal** marks. Schematic diagrams must be shown wherever*
  necessary. Any data you feel missing suitably be assumed and stated clearly.
  Units of quantities used/calculated must be stated clearly.
  Use of following supporting material is permitted during examination.
  (Mentioned in form No.205)

1. NIL _____   2. NIL _____

Q.1 COMPULSORY

Answers for each sub – question be given in about 25 words.   [8×2=16]

  (a) Explain Zener diode operation

  (b) State Fleming's Left hand rule.

  (c) Implement an XOR gate using NOR gates only.

  (d) Explain commutator working in DC Motor.

  (e) Convert $(689)_{10}$ into hexadecimal.

  (f) Find the average value of Periodic sine wave for complete cycle which is
       clamped to half its Positive Maximum Value.

  (g) Establish relation of Power Consumed in balanced 3 – Phase load.

  (h) Explain Statically & Dynamically induced emf with examples.

Q.2 (a) Explain Principle, construction and working of 3 – Phase Induction Motor, with suitable diagram. [8]

(b) Find the r. m. s. value of sine wave for complete cycle which is clamped to half its negative Maximum Value. [8]

Q.3 (a) Explain Principle of operation of Transformer and Draw its Phasor diagram referred to secondary side, supplying Leading Power factor Load. [8]

(b) Explain the Principle of operation of D. C. generator and also derive its E. M. F. equations. [8]

Q.4 (a) Explain Principle of operation and characteristics of P – N junction diode. [8]

(b) Explain Principle of operation and characteristics of BJT. [8]

Q.5 (a) Using Boolean Techniques simplify the following expression: [8]

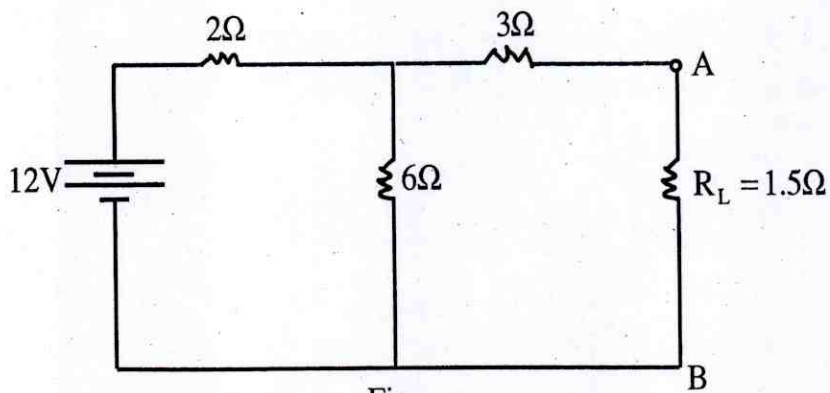Y = (A+B+C).(A+B)

(b) Draw the truth table of universal logic gates. [8]

Q.6 (a) What is the value of series resistance required when 20watts, 15volts, 1000 milliampere Zener diode are connected in series to obtain 20volts regulated output from 40 volts d.c. source. [8]

(b) (i) State and Explain Norton's theorem [2]

(ii) Find the load current I_L in R_L [6]

Fig

Q.7 (a) Explain PMMC instruments with suitable diagrams and necessary formulas. [8]

(b) Explain AC watt hour meter with suitable diagram and necessary Mathematics formulas. [8]

Roll No. _____   Total No of Pages: 3

2E2306

2E2306

B. Tech. II Sem. (Main) Exam., May – 2018

ME -102 Basic Mechanical Engineering

Time: 3 Hours   Maximum Marks: 80
                                                         Min. Passing Marks: 28

Instructions to Candidates:

Attempt any five questions including Question No. 1, which is Compulsory.
All questions carry equal marks. Schematic diagrams must be shown wherever
necessary. Any data you feel missing suitably be assumed and stated clearly.
Units of quantities used/calculated must be stated clearly.
Use of following supporting material is permitted during examination.
(Mentioned in form No.205)

1. NIL _____   2. NIL _____

Q.1   Compulsory   [8×2=16]

Answers for each sub-question be given 50 words- (each question carry 2 marks)

(a)   Describe different modern tools used in mechanical engineering.

(b)   Describe law of thermodynamics.

(c)   Describe different fields of manufacturing technology.

(d)   Differentiate between water tube boiler and fire tube boiler.

(e)   Differentiate between impulse and reaction turbine.

(f)   Write a short note on different types of power plant.

(g)   What is industrial engineering & its scope?

(h)   Define steam boiler & write different types of boiler.

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Q.2 (a) Differentiate between 2 stroke & 4 stroke engine. [4]

(b) Describe ideal Otto cycle & derive formula for its efficiency. [4]

(c) Diesel cycle with compression ratio of CR=20 : 1 and cut –off ratio α=2. The air is at 100 kPa=1 bar, 20°C (293K), and the volume of the chamber is 500 cm^3 prior to the compression stroke.

(i) Specific heat capacity at constant pressure of air at atmospheric pressure and room temperature: C_p = 1.01 kJ/kgK

(ii) Specific heat capacity at constant volume of air at atmospheric pressure and room temperature: C_v = 0.718 kJ/kgK.

(iii) K= C_p/C_v = 1.4

Calculate: The mass of intake air, the temperature T2, the pressure P2, the temperature T3, the amount of heat added by burning of fuel-air mixture, the thermal efficiency of this cycle. [8]

Q.3 (a) What is meant by refrigeration system?Describe vapor compression refrigeration system. [8]

(b) What is air conditioning ? Draw and describe different components used in it. [4]

(c) Ice is formed at 0°C from water at 20°C, the temperature of refrigerant is 10°C. Find the ice formed per KWH ,assume latent heat of ice is 334 kJ/kg. Assume working in perfect Carnot cycle. [4]

(d) What is transmission? Describe different types of gear. [8]

(e) Describe different types of belt drive. [4]

[6120]

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(c) Two spur gear have velocity ratio 1/3, driven gear has 72 teeth of 8 module & rotate at 300 rpm, calculate no. of teeth & speed of driver, also calculate pitch line velocity. Given:

T2=72, VR=1/3, N2=300 rpm, m=8mm

VR=N2/ N1= T1/T2=1/3. [4]

Q.5 (a) Write a short note on- [6]

(i) Extrusion

(ii) Rolling

(iii) Drawing

(b) What is metal casting? Describe different methods of metal casting. [5]

(c) Write a brief note on Lathe machine. [5]

Q.6 (a) Describe hardening and tempering of steel. [8]

(b) Describe the following terms- [8]

(i) Case hardening

(ii) Carburizing

(iii) Nitriding

(iv) Cyaniding

(v) Carbonitriding

Q.7 (a) What is Computer Added Design (CAD)? Describe its working. [8]

(b) What is MEMS? Write an essay on it. [8]

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2E1024

2E1024

B. Tech. II Sem. (Back) Exam., May – 2018
Common to All Branch
204 (O) Environmental Engineering & Disaster Management

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL _____   2. NIL _____

UNIT-I

Q.1 Explain Acts & Regulations of Environment in detail.   [16]

OR

Q.1 Write short notes on –

   (a) Energy Flow in ecosystem   [8]

   (b) Solar energy   [8]

UNIT-II

Q.2 (a) Explain various sources of water.   [8]

   (b) Write note on 'Anaerobic digestion'.   [8]

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OR

Q.2 What is environmental impact assessment (EIA), also discuss the necessity & methodology of EIA. [16]

UNIT-III

Q.3 (a) Define air pollution. Discuss harmful effects of air pollution on environment & human health. [10]

(b) Write note on 'ozone depletion' [6]

OR

Q.3 Write short notes on – (any two) [8+8=16]

(a) Acid Rain

(b) Noise Pollution control method

(c) Classification of solid waste.

UNIT-IV

Q.4 (a) Define disaster. Give their types with detail. [10]

(b) Give an account on Environmental Hazards. [6]

OR

Q.4 (a) Explain natural & manmade disasters. [10]

(b) Write note on Fire Hazard & Chemical Hazard. [3+3=6]

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UNIT-V

Q.5 Write note on Earthquake Energy & Earthquake magnitude   ·   [8+8=16]

OR

Q.5 Write note on Epicenter & Epicentral distance & Earth-quake resistant

house.   [8+8=16]

Roll No. _____

2E2303

2E2303

Total No of Pages: 3

2E2303

B. Tech. II Sem. (Main) Exam., May – 2018
CS -103 Computer Programming - II

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 28

Instructions to Candidates:

*Attempt any **five questions** including Question No. 1, which is Compulsory. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. <u>NIL</u>   2. <u>NIL</u>

Q.1 COMPULSORY

Answers for each sub-question be given in about 25 words.   [8×2=16]

(a)   Why do we include <stdio.h> in our programs?

(b)   Define a function.

(c)   How is an array represented in memory?

(d)   Differentiate between a character and a string.

(e)   Differentiate between ptr ++ and * ptr ++.

(f)   Differentiate between a structure and an array.

(g)   What do you understand by EOF?

(h)   "Structure declaration reserves memory for the structure" Comment on this

statement with valid justification.

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Q.2 (a) How are strings read from the standard input device? Explain the different functions used to perform string input operation. [8]

(b) Write a program in C that replaces a given character with another character in the string. [8]

Q.3 Write a program to create a structure with the information given below. Then read and print the data. [16]

(a) Emp_Id

(b) Name-

(i) First Name

(ii) Middle Name

(iii) Last Name

(c) Address-

(i) Area

(ii) City

(iii) State

(d) Age

(e) Salary

(f) Designation

Q.4 (a) What is the advantage of using structures? Differentiate between a structure and a Union. [8]

(b) What is dynamic memory allocation? What are the various functions in C that are used for dynamic memory allocation? Explain. [8]

Q.5 (a) Write a short note on the following functions. For each function, give a program code that demonstrates its usage- [8]

    (i) fopen ( )

    (ii) fclose ( )

    (iii) fgets ( )

    (iv) fseek ( )

(b) Write a program to read data from the keyboard and write it to a file. Read the contents stored in the file and display it on the screen. [8]

Q.6 Write short notes on: [4×4=16]

    (i) System software

    (ii) Compiler

    (iii) Loader

    (iv) Freeware software

Q.7 (a) Write a program using pointers to insert a value in an array. [8]

(b) Explain the difference between a null pointer and a void pointer. What do you mean by pointer arithmetic? [8]

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2E2006

2E2006
B. Tech. II Sem. (Back) Exam., May – 2018
206 Fundamentals of Computer Programming

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. <u>NIL</u>   2. <u>NIL</u>

UNIT-I

Q.1 (a) Explain the storage classes with Examples. How it is used in C language?   [8]

(b) Write a program to generate the following pattern.   [8]

```
*   *   *   *   *

  *   *   *   *

    *   *   *

      *   *

        *
```

OR

Q.1 (a) What is meant by scope of variables in C? What are the different types of variables on the basis of scope? List and Explain with example. [10]

(b) What are the data types available in C? Explain with example. [6]

UNIT-II

Q.2 (a) Write a program in C language for swapping two numbers using pointer. [8]

(b) What is pointer? Discuss advantages of pointer. [8]

OR

Q.2 (a) What is Array? What are the advantages of array? Write a program to find maximum value from n values in array. [5+5=10]

(b) What do you mean by Command Line Arguments? Explain with example. [6]

UNIT-III

Q.3 (a) Explain the file opening option used to open a file in C language. What are the different modes associated with f open ( )? [10]

(b) Differentiate between Static Memory Allocation and Dynamic Memory Allocation. [6]

OR

Q.3 (a) Can a file be opened simultaneously for reading and writing? Justify your

answer. [8]

(b) What are the differences between arrays and structure? What do you mean by

Structure declaration and Array of Structure declaration? Explain

with example. [8]

UNIT-IV

Q.4 (a) What is Structure? What are its advantages? [8]

(b) Differentiate between Call by value and Call by reference passing methods. [8]

OR

Q.4 (a) Explain functions in C language with example. [10]

(b) Write short note on passing an array to a function? [6]

UNIT-V

Q.5 (a) Define block diagram of computer system. [4]

(b) Explain about compiler, assembler and interpreter. [4]

(c) Explain various types of memory in detail. [8]

OR

Q.5 (a) Make a flow chart to find Maximum number among three numbers. [4]

(b) Convert the following: [12]

(i) $(D3E0)_{16} = (?)_{10}$

(ii) $(736.5)_8 = (?)_{10}$

(iii) $(.101011)_2 = (?)_8$

(iv) $(FB9.EC)_{16} = (?)_8$

(v) $(26.875)_{10} = (?)_2$

(vi) $(845.5)_{10} = (?)_{16}$

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2E2002

2E2002
B. Tech. II Sem. (Back) Exam., May – 2018
202Engineering Mathematics - II

Time: 3 Hours   **Maximum Marks: 80**
                                                     Min. Passing Marks: 24

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL _____   2. NIL _____

UNIT-I

Q.1 (a) A plane passes through the fixed point (a, b, c) and cut the axes in A, B, C. Show that the locus of the centre of the sphere OABC is

$$\frac{a}{x}+\frac{b}{y}+\frac{c}{z}=2$$ [8]

(b) Find the equation of the right circular cylinder whose guiding curve is the circle

$$x^2 + y^2 + z^2 = 9, \quad x - y + z = 3$$ [8]

OR

Q.1 (a) Find the equation of the sphere that passes through the circle $x^2 + y^2 + z^2 - 2x + 3y - 4z + 6 = 0$, $3x - 4y + 5z = 15$ and cuts the sphere $x^2 + y^2 + z^2 + 2x + 4y - 6z + 11 = 0$ orthogonally.   [8]

(b) Find the equation of the right circular cone with vertex at the origin, axis is the

line $\dfrac{x}{2} = \dfrac{y}{-4} = \dfrac{z}{3}$ and which passes through the point (1, 1, 2). [8]

UNIT-II

Q.2 (a) Investigate the values of λ and μ so that the equations $2x + 3y + 5z = 9$, $7x + 3y$

$- 2z = 8$, $2x + 3y + \lambda z = \mu$ have (i) no solution, (ii) unique solution and (iii) an

infinite number of solutions. [8]

(b) Find the Eigen values and Eigen vectors of the matrix

$$A = \begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$$

Hence, reduce the given matrix into the diagonal form. [8]

OR

Q.2 (a) Test the consistency of the following equations, and if possible, find the solution:

$5x + 3y + 7z = 4$, $3x + 26y + 2z = 9$, $7x + 2y + 10z = 5$ [8]

(b) State Cayley – Hamilton theorem. Verify it for the matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

Hence find A^{-1}. [8]

UNIT-III

Q.3 (a) If $\vec{F} = (y^2 + 2xz^2)\hat{i} + (2xy - z)\hat{j} + (2x^2z - y + 2z)\hat{k}$ be a vector point function, then

show that $\vec{F}$ is irrotational and hence find its scalar potential. [8]

(b) Evaluate $\iint_s \left(yz\hat{i} + zx\hat{j} + xy\hat{k} \right).ds$, where s is the surface of the sphere

$x^2 + y^2 + z^2 = 1$ in the first octant. [8]

OR

Q.3 (a) Show that $\vec{F} = \left(2xy + z^3 \right)\hat{i} + x^2\hat{j} + 3z^2x\hat{k}$ is a conservative field. Find its scalar

potential and also the work done in moving a particle from (1, -2, 1) to

(3, 1, 4). [8]

(b) Find the constants a and b so that the surface $ax^2 - byz = (a+2)x$ will be orthogonal

to the surface $4x^2y + z^3 = 4$ at the point (1, -1, 2). [8]

UNIT-IV

Q.4 (a) Verify Green's theorem in a plane for, $\int_c [(3x^2 - 8y^2)dx + (4y - 6xy)dy]$, where c is

the boundary of the region defined by the lines x = 0, y = 0 and x + y = 1. [8]

(b) Obtain the Fourier series for the function $f(x) = x^2$, $-\pi < x < \pi$ and deduce from it

$$\frac{\pi^2}{6} = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \ldots\ldots\ldots$$

$$\frac{\pi^2}{12} = 1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ldots\ldots\ldots$$

and $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \ldots\ldots\ldots$ [8]

OR

Q.4 (a) Use Stoke's theorem to evaluate $\int_c \vec{F}.d\vec{r}$, where $\vec{F} = (\sin x - y)\hat{i} - \cos x\,\hat{j}$ and c is

the boundary of the triangle whose vertices are $(0, 0)$, $\left(\dfrac{\pi}{2}, 0\right)$ and $\left(\dfrac{\pi}{2}, 1\right)$. [8]

(b) Obtain the first three cosine terms and constant terms in the Fourier series for y, where [8]

x	0	1	2	3	4	5
y	4	8	15	7	6	2

UNIT-V

Q.5 (a) Solve: $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$ [6]

(b) Find the complete integral of $p^3 + q^3 = 3pqz$ [6]

(c) Find the singular integral of $z = px + qy + p^2 + q^2$ [4]

OR

(a) Solve in series: $2x^2\dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} + (1 - x^2)y = 0$ [8]

(b) Use Charpit's method to solve:

$px + qy = pq$ [8]

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2E2301

2E2301

B. Tech. II Sem. (Main) Exam., May – 2018

MA-102 Engineering Mathematics - II

Time: 3 Hours   **Maximum Marks: 80**
                                                   Min. Passing Marks: 28

Instructions to Candidates:

*Attempt any **five questions** including Question No. 1, which is Compulsory. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No.205)*

1. NIL _____   2. NIL _____

Q.1 COMPULSORY,

Answers for each sub-question be given in about 25 words -

(a) Define rank of a matrix.   [2]

(b) Find the Eigen values of the matrix -   [2]

$$\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$$

(c) Write Euler's formulae for the Fourier series in the interval $(-\pi, \pi)$.   [2]

(d) Determine b_n for the Fourier series of the function :   [2]

$$f(x) = x, \; -\pi < x < \pi$$

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(e)   Define linear differential equation by giving an example.   [2]

(f)   Find CF of following differential equation -   [2]

$$(D^3 - 13D + 12)\, y = 0,\ D = \frac{d}{dx}$$

(g)   Find PI of following differential equation -   [2]

$$x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + 4y = 2x^2$$

(h)   Form the partial differential equation by using the elimination of arbitrary function -   [2]

$$z = f\left(\frac{y}{x}\right)$$

Q.2 (a)   Find the rank of the matrix -   [8]

$$A = \begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$$

after reducing it to the normal form.

(b)   Examine the consistency of the system: [8]

$$x + y + z = 6$$

$$2x + y + 3z = 13$$

$$5x + 2y + z = 12$$

$$2x - 3y - 2z = -10$$

and solve them if they are consistent.

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Q.3 (a) Find the Eigen values and the corresponding Eigen vectors of the following

matrix : $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ [8]

(b) Find the Fourier series for the following function - [6+2=8]

$$f(x) = \begin{bmatrix} -\pi, & \text{for} & -\pi < x < 0 \\ x, & \text{for} & 0 < x < \pi \end{bmatrix}$$

Hence deduce that: $\dfrac{\pi^2}{8} = \dfrac{1}{1^2} + \dfrac{1}{3^2} + \dfrac{1}{5^2} + \dots\dots\dots$

Q.4 (a) Obtain the Fourier series for $f(x) = x \cos x$, $-\pi < x < \pi$. [8]

(b) Express y in a Fourier series upto second harmonic for the following table - [8]

x:	0	$\pi/3$	$2\pi/3$	π	$4\pi/3$	$5\pi/3$	2π
y:	1.98	2.15	2.77	-0.22	-0.31	1.43	1.98

Q.5 (a) Solve the following differential equation - [8]

$$(y + \frac{1}{3}y^3 + \frac{1}{2}x^2)\,dx + \frac{1}{4}(1 + y^2)\,xdy = 0$$

(b) Solve - [8]

$$(D^2 + 2D + 1)\, y = e^x + x^2 - \sin x$$

Q.6 (a) Solve - [8]

$$x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} - 3y = x^2 \log x$$

(b) Solve the following differential equation - [8]

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

Q.7 (a) Solve - [8]

$$(y+z)p + (z+x)q = x+y$$

(b) Solve the following differential equation by using Charpit's method - [8]

$$pxy + pq + qy = yz$$