

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: ME100**

**Course Name: BASICS OF MECHANICAL ENGINEERING**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two questions, each carries 15 marks.*

- 1 a) Distinguish between open and closed systems. Quote one example each for them. (5)
- b) State zeroth law and first law of thermodynamics. What are their engineering (10)  
significance?
- 2 With the help of proper thermodynamic diagrams derive the expression for air (15)  
standard efficiency of an Otto cycle.
- 3 a) State advantages and limitations of water tube boilers. (5)
- b) With the aid of neat sketch explain the working of fire tube boiler. (10)

**PART B**

*Answer any two questions, each carries 15 marks.*

- 4 a) What is an automobile? Discuss the classification of automobiles. (10)
- b) Discuss the impact of refrigerants on environment. (5)
- 5 Draw a layout of an automobile. Explain the major components (any three) with (15)  
help of neat diagrams.
- 6 a) Describe the working of a window air conditioner with neat diagram. (10)
- b) Differentiate between a heat pump and a refrigerator. Show the relation between (5)  
their COP's

**PART C**

*Answer any two questions, each carries 20 marks.*

- 7 a) What are the major properties of engineering materials? (10)
- b) Give a brief account of different types of engineering materials. (10)
- 8 a) What are the important types of metal joining processes? (6)
- b) Explain any two welding operations with neat diagrams. (14)
- 9 a) Using a block diagram, explain components of a CNC machine. (10)
- b) Explain the mechanism of shaping machine with the help of a neat sketch. (10)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: EC100**

**Course Name: BASICS OF ELECTRONICS ENGINEERING**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 5 marks.*

- |   |  | Marks |
|---|--|-------|
| 1 | With the help of neat diagram, explain the construction and working of electrolytic capacitor.   | (5)   |
| 2 | With the help of energy band diagram explain insulators, conductors and semiconductors.  | (5)   |
| 3 | Draw the block diagram of a DC power supply and mention the functions of each block.   | (5)   |
| 4 | Why are universal gates called so? Realize a two input OR gate using any one of the universal gates.   | (5)   |
| 5 | Write main features of the orbit of a geo stationary satellite.  | (5)   |
| 6 | Draw the frequency spectrum of an amplitude modulated (AM) wave. Given that modulating signal is of frequency $f_m$ , amplitude $V_m$ and carrier of frequency $f_c$ , amplitude $V_c$ . Take modulation index as $m$ . What is the bandwidth requirement of this AM wave? | (5)   |
| 7 | Draw and explain the structure of an optical fiber cable.  | (5)   |
| 8 | With supporting diagram explain frequency reuse done in cellular communication.  | (5)   |

**PART B**

*Answer six questions, one full question from each module and carries 10 marks.*

**Module I**

- |   |   |     |
|---|---|-----|
| 9 | a) Write the significance of specifying tolerance value of a component. A ceramic capacitor has got the following code marked on its surface. Identify the capacitance value. (i) 103J (ii) 2n2 | (5) |
|   | b) Explain the basic working principle of transformer. Write the equation relating primary and secondary voltages to turns ratio.   | (5) |

**OR**

- |    |  |     |
|----|--|-----|
| 10 | a) Explain the working of electromagnetic relays.                      | (5) |
|    | b) Write and explain any five applications of Electronics in industry. | (5) |

**Module II**

- |    |  |      |
|----|--|------|
| 11 | With neat diagrams, explain the input and output characteristics of a common emitter NPN transistor. | (10) |
|----|--|------|

**OR**

- |    |   |     |
|----|---|-----|
| 12 | a) Derive the relation between $\alpha$ and $\beta$ for a transistor. For an npn transistor, $\alpha =$ | (5) |
|----|---|-----|

0.995 and  $I_E = 10\text{mA}$ . Find  $I_B$  and  $I_C$ .

- b) Explain the diode equation. The forward current flowing through a diode at room temperature is  $1\text{mA}$  when the forward bias applied is  $0.2\text{V}$ . The reverse saturation current through the diode is  $0.45\mu\text{A}$  at room temperature. Determine whether the diode is made up of Silicon or Germanium. (5)

**Module III**

- 13 a) Draw the block diagram of a public-address system and specify the functions of each. (5)  
 b) Draw the circuit diagram of an RC phase shift oscillator and explain the need of each component. (5)

**OR**

- 14 With suitable circuit diagram explain how a Zener diode can be used as a voltage regulator. Differentiate between line regulation and load regulation. (10)

**Module IV**

- 15 a) Draw the functional block diagram of an operational amplifier. Define any two parameters and specify its ideal values. (5)  
 b) Draw circuit diagram and derive expressions for gain of inverting and non-inverting amplifier using Op-Amp. (5)

**OR**

- 16 a) Explain the working of digital multimeter with a block diagram. (5)  
 b) Draw the block diagram of Digital Storage Oscilloscope and explain the working (5)

**Module V**

- 17 a) Explain satellite communication system with block diagram. (5)  
 b) Explain advantages and disadvantages of satellite communication. Specify one frequency band used for satellite communication. (5)

**OR**

- 18 a) Draw block diagram and explain functioning of superheterodyne receiver. (5)  
 b) Write the principle of frequency modulation and list the advantages of FM over AM. (5)

**Module VI**

- 19 a) What is meant by critical angle? What is its significance in optical fiber communication? (5)  
 b) Draw and explain functional block diagram of cellular communication system (5)

**OR**

- 20 a) Use block diagram representation to explain the functioning of DTH. (5)  
 b) With the help of suitable diagrams, explain the working of CCTV. Give one application. (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

Course Code: EE100

Course Name: **BASICS OF ELECTRICAL ENGINEERING**

Max. Marks: 100

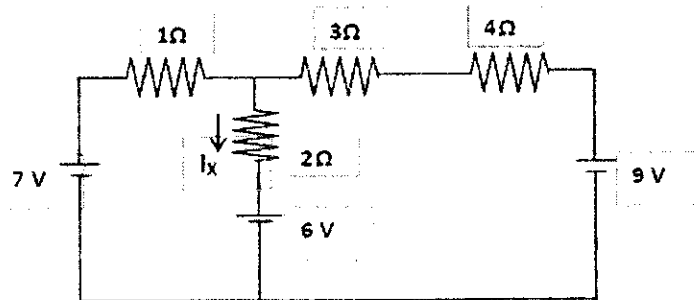
Duration: 3 Hours

**PART A***Answer all questions, each carries 4 marks*

- |    |   | Marks |
|----|---|-------|
| 1  | Differentiate between Constant voltage and constant current sources.    | (4)   |
| 2  | Compare electric and magnetic circuits.                                 | (4)   |
| 3  | Derive the expression for RMS value of a sinusoidal waveform.           | (4)   |
| 4  | Write the expression for three phase power in a delta connected system. | (4)   |
| 5  | What are the advantages of a hydroelectric power plant?                 | (4)   |
| 6  | Explain the working principle of a photovoltaic cell.                   | (4)   |
| 7  | Explain the working principle of a DC motor.                            | (4)   |
| 8  | Derive the emf equation of a transformer.                               | (4)   |
| 9  | Define and write the expression for slip of a 3 phase induction motor.  | (4)   |
| 10 | Explain the working of a capacitor start single phase induction motor.  | (4)   |

**PART B****MODULE (1-4)***Answer any four questions, each carries 10 marks*

- 11 a) Solve the following circuit using mesh analysis and find  $i_x$  (5)



- b) With a sample circuit, explain the step by step procedure of nodal analysis. (5)
- 12 a) State and explain Faraday's laws of electromagnetic induction. (5)
- b) With suitable example, explain statically and dynamically induced emf. (5)
- 13 a) Define and obtain the expression for power factor, active power, reactive power and apparent power of a series RLC circuit. (5)
- b) A  $50\Omega$  resistor in series with  $120\mu\text{F}$  capacitor is connected to 230V 50Hz supply. Find i) impedance ii) current iii) power factor iv) voltage across the resistor v) voltage across the capacitor. (5)
- 14 a) Explain the 2 wattmeter method of power measurement using the circuit arrangement. (5)
- b) A 3 phase 4 wire 400V system feeds three loads  $10 - j8\Omega$  each connected in star. (5)

Calculate the line currents in each phase.

- 15 With the help of a neat diagram, explain the working of a nuclear power plant. (10)
- 16 a) Explain the need for high voltage transmission. (5)  
b) Explain the principle and operation of circuit breaker used in substation. (5)

#### MODULE 5

*Answer any one full question*

- 17 a) Explain different types of dc generators with suitable circuit diagrams and obtain voltage and current expressions of each. (7)  
b) The maximum value of flux density in the core of a 250/3000V, 50Hz single phase transformer is 1.5Wb/m<sup>2</sup>. If the emf /turn is 8V, determine i) primary and secondary number of turns ii) area of the core. (3)

OR

- 18 a) Draw and explain the constructional details of 3 phase transformers. (5)  
b) A 220V DC shunt motor takes 30A at full load. Find the back emf developed if the armature and shunt field resistances are 0.5Ω and 110Ω respectively. (5)

#### MODULE 6

*Answer any one full question*

- 19 a) Draw and explain the constructional details of a 3 phase squirrel cage induction motor. (5)  
b) A 6 pole 3phase induction motor operates from a supply whose frequency is 50Hz. Calculate  
i) The speed at which the magnetic field of the stator is rotating.  
ii) The speed of the rotor when the slip is 0.03 (5)

OR

- 20 a) Explain why single phase induction motors are not self-starting. (5)  
b) Draw and explain the constructional features of a three phase induction motor. (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: CE100**

**Course Name: BASICS OF CIVIL ENGINEERING**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 3 marks.*

- |    |  |     |
|----|--|-----|
| 1  | Explain relevance of civil engineering in overall infrastructure development of the country. | (3) |
| 2  | Enumerate the factors affecting orientation of the building.                                 | (3) |
| 3  | What are the principles of surveying?  | (3) |
| 4  | Compare PCC and RCC.   | (3) |
| 5  | What do you mean by bearing capacity of soil?  | (3) |
| 6  | Discuss the purposes of plastering?  | (3) |
| 7  | List down the different market forms of steel.   | (3) |
| 8  | What are the design consideration of ramps?  | (3) |
| 9  | List any six sound proofing materials.   | (3) |
| 10 | What is an intelligent building?   | (3) |

**PART B**

*Answer any eight questions, each carries 6 marks.*

- |    |  |     |
|----|--|-----|
| 11 | Explain classification of buildings as per NBC.  | (6) |
| 12 | Briefly explain different components of building with a neat figure.   | (6) |
| 13 | What are the requisites of a good site plan?   | (6) |
| 14 | Discuss the various principles of building planning.   | (6) |
| 15 | Describe the open space requirements of a building.  | (6) |
| 16 | Explain direct ranging?  | (6) |
| 17 | The following consecutive readings are taken on a level with station A as Bench mark (R.L. of the Bench mark is 200.00 m).<br>2.190, 3.150, 1.060, 0.230, 3.430, 3.170, 3.420, 3.720, 2.390 The instrument is shifted after the reading 3.430. Enter these readings in level book and calculate the reduced level of all points. | (6) |
| 18 | Discuss the different types of tests on bricks.  | (6) |
| 19 | Define the following:<br>i) Height of instrument      ii) Reduced level      iii) Line of collimation  | (6) |
| 20 | Describe the different types of cement and its uses.   | (6) |

**PART C**

*Answer any two questions, each carries 11 marks.*

- |    |  |     |
|----|--|-----|
| 21 | a) Explain classification of foundation with neat sketches.                  | (6) |
|    | b) Draw the plan and elevation of one brick thick wall English bond.         | (5) |
| 22 | a) Discuss any six types of flooring materials.                              | (6) |
|    | b) Discuss briefly the different aspects of escalators.                      | (5) |
| 23 | a) Explain different air conditioning systems.                               | (5) |
|    | b) Write short note on:<br>i) Chimneys      ii) Towers      iii) Water tanks | (6) |

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: BE103**

**Course Name: INTRODUCTION TO SUSTAINABLE ENGINEERING**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all "a" OR "b" set questions, each set carries 5 marks.*

Marks

- |           |  |     |
|-----------|--|-----|
| 1         | a) What are the three levels with which you approach a sustainable issue? Explain with an example.                                       | (5) |
| <b>OR</b> |  |     |
|           | b) List any five multi lateral environmental agreements.   | (5) |
| 2         | a) Apply 3R concept to mineral water bottles.  | (5) |
| <b>OR</b> |  |     |
|           | b) List and explain any three local and regional environmental issues.   | (5) |
| 3         | a) Can we use life cycle analysis (LCA) as a tool for profit making? How?  | (5) |
| <b>OR</b> |  |     |
|           | b) List any 5 products developed bases on bio mimics.  | (5) |
| 4         | a) List specialities of a green building in your dream and suggest any five green building materials that you will suggest for the same. | (5) |
| <b>OR</b> |  |     |
|           | b) Suggest any three suitable green transport systems for your travel from place of stay to college.                                     | (5) |
| 5         | a) Suggest two renewable energy sources for our state and validate your suggestion.  | (5) |
| <b>OR</b> |  |     |
|           | b) What are the energy saving opportunities in a house?  | (5) |
| 6         | a) Suggest two renewable energy sources that can be utilized in automobiles.   | (5) |
| <b>OR</b> |  |     |
|           | b) Explain different method using which we can utilize solar energy.   | (5) |
| 7         | a) Apply idea of industrial symbiosis to the coconut oil industry  | (5) |
| <b>OR</b> |  |     |
|           | b) Do you prefer an urban area living? Substantiate your answer.   | (5) |
| 8         | a) In your view point, what are reasons of poverty?  | (5) |
| <b>OR</b> |  |     |
|           | b) As an engineer suggest any 5 points to reduce pollution by an industry in your locality.  | (5) |

**PART B**

*(Read the Stories/Cases/Data set as the case may be, and answer all questions, each full question carries 10 marks.)*

**Module 1**

- |   |  |     |
|---|--|-----|
| 9 | a) List social, economic and environmental aspects of a hydro electric power project proposed/implemented in Kerala state. | (4) |
|   | b) Do you think Indian water act is sufficient to protect the water body that you  | (2) |

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selected in the last question?

- c) Identify an engineering/social problem in your locality and suggest any sustainable solution. (2)
- d) What are the challenges that you will face while you are trying to implement the solution you suggested in the last question? (2)

**Stories/Cases/Data set - 2**

In metro cities in India, an individual produces an average of 0.8 kg/ waste/ person daily. The total municipal solid waste (MSW) generated in urban India has been estimated at 68.8 million tons per year (TPY) (0.573 million metric tons per day (MMT/d) in the year 2008). The average collection efficiency of MSW ranges from 22% to 60%. MSW typically contains 51% organic waste, 17% recyclables, 11% hazardous and 21% inert waste. However, about 40% of all MSW is not collected at all and hence lies littered in the city/town and finds its way to nearby drains and water bodies, causing choking as well as pollution of surface water. Unsegregated waste collection and transportation leads to dumping in the open, which generates leachate and gaseous emissions besides causing nuisance in the surrounding environment. Leachate contaminates the groundwater as well as surface water in the vicinity and gaseous emissions contribute to global warming.

**Module II**

- 10 a) Do you think local environmental issues contribute to global warming? (2)
- b) Suggest any three solutions to the issues, mentioned in the above data. (4)
- c) List any three global impacts of issues mentioned in above information. (2)
- d) Do you prefer 3R concept or zero waste concept to address above issue? (2)

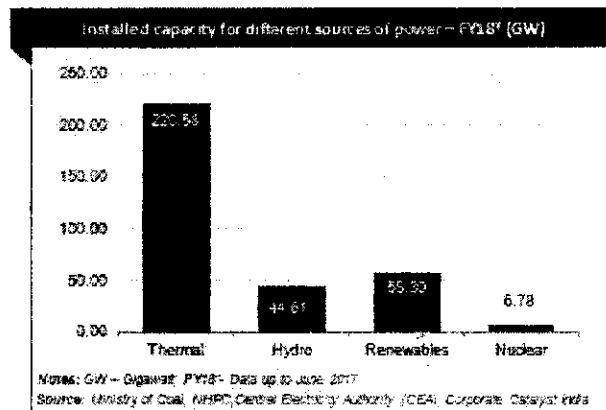
**Module III**

- 11 a) Conduct a sample life cycle analysis of any product given below (10)
- Plastic pet bottles, lead acid batteries or hollow bricks.

**Module IV**

- 12 a) Prepare schematic representation of a residential building with minimum ten (10) aspects that are applicable to green buildings.

**Stories/Cases/Data set - 5**



**Module V**

- 13 a) Comment about the utilization of renewable energy sources in India based on the above data. (3)



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- b) What are the challenges that we face to develop renewable sources in India? (3)
- a) List the different sources that continues to the item renewable in the above data (2)

**Stories/Cases/Data set - 6**

(Stories/Cases/Data set)

**Industrial Ecology In Practice**

**Kalundborg, Denmark**

The exchange of 'wastes' between independent firms in some sectors has been taking place for over a century, simply because it makes good business sense. The establishment of 'industrial ecosystems,' however, is a relatively new phenomenon, with the best known example being located in Kalundborg, Denmark. There, an industrial ecosystem has been established which involves an oil refinery, a gyproc factory, a pharmaceutical firm, a fish farm, a coal-fired electrical power station and the municipality of Kalundborg, among others. At Kalundborg, steam and various raw materials such as sulfur, fly ash and sludge are exchanged in what is the world's most elaborate industrial ecosystem. Participating firms each benefit economically from reduce costs for waste disposal, improved efficiencies of resource use and improved environmental performance. For example, gas captured from the oil refinery which had previously been flared off is now sent to the electrical power station which expects to save the equivalent of 30,000 tons of coal a year.

**Module VI**

- 14 a) Based on above story explain your ideas about industrial ecology. 2
- b) Can we implement industrial ecology in India? Substantiate your answer. 2
- c) Differentiate industrial ecology and industrial symbiosis with examples. 2
- d) List four set of industries were we can implement industrial symbiosis. 4

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: BE100**

**Course Name: ENGINEERING MECHANICS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 5 marks.*

- |   |  | Marks |
|---|--|-------|
| 1 | State and explain Lami's theorem.  | (5)   |
| 2 | A force of 1000N acts on a bracket as shown in Fig 1. Determine the moment of the force about Q. | (5)   |

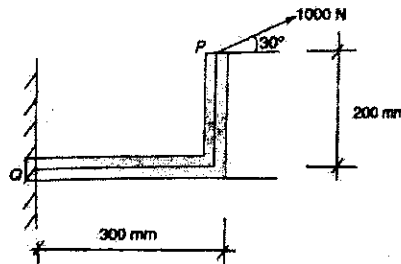


Fig. 1

- |   |   |     |
|---|---|-----|
| 3 | State and prove parallel axis theorem.  | (5) |
| 4 | Using the principle of virtual work, determine the reactions of a beam AB of span 8m. The beam carries a point load of 4kN at a distance of 3m from A.  | (5) |
| 5 | A wheel is rotating about its axis with a constant angular acceleration of $3 \text{ rad/s}^2$ . If the initial and final angular velocities are $5.25 \text{ rad/s}$ and $10.5 \text{ rad/s}$ , determine the total angle turned through, during this interval.  | (5) |
| 6 | a) A vertical lift of total mass 500kg acquires an upward velocity of 2m/s over a distance of 3m of motion with constant acceleration, starting from rest. Apply D'Alembert principle to calculate the tension in the cable supporting the lift.  | (3) |
|   | b) If the lift, while stopping, moves with a constant deceleration and comes to rest in 2s, calculate the force transmitted by a man of mass 75kg on the floor of the lift during that interval.  | (2) |
| 7 | Explain longitudinal, transverse and torsional vibrations with sketches.  | (5) |
| 8 | A helical spring of negligible mass is found to extend 0.15mm under a mass of 0.5kg. Then a mass of 40kg is attached at its lower end. The spring mass system is displaced vertically through 100mm and released. Find the stiffness of the spring, period of oscillation and its natural frequency for the SHM produced. | (5) |

**PART B**

*Answer any 2 questions from each SET*

**SET 1**

*Each question carries 10 marks.*

- |   |   |     |
|---|---|-----|
| 9 | a) Two forces F and 2F act on a particle. If the first force is increased by 12kN and the second force is doubled, the direction of their resultant remains unchanged. Find the value of F. | (5) |
|   | 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           | (5) |

direction of the resultant forces.

- 10 A beam AB 10m long is hinged at A and supported on rollers over a smooth surface inclined at  $30^\circ$  to the horizontal at B. The beam is loaded as shown in Fig 2. Determine the reactions at A and B. (10)

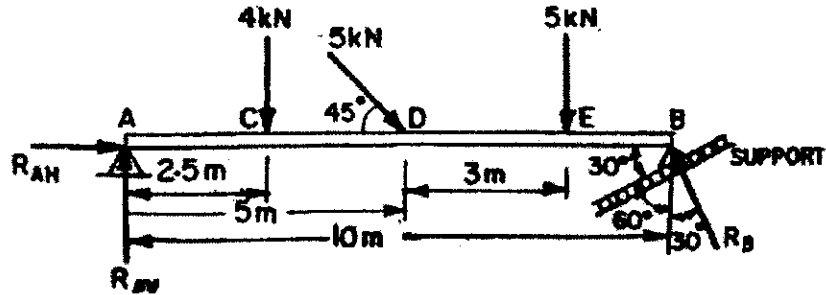


Fig. 2

- 11 a) Three cylinders with given diameters are arranged as shown in fig 3. The cylinders A and B weigh 1000N each and the weight of cylinder C is 2000N. Determine the forces exerted at the contact points. (5)

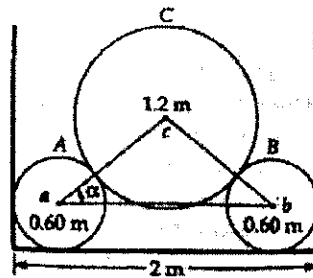


Fig. 3

- b) A rigid bar is subjected to a system of parallel forces as shown in Fig 4. Reduce this system to a single force and moment system at A. (5)

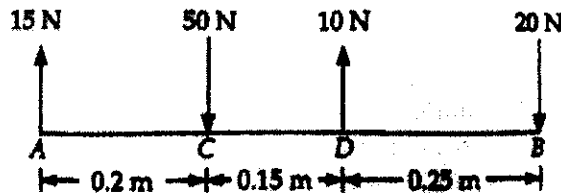


Fig. 4

SET II

Each question carries 10 marks

- 12 Locate the centroid of the shaded area shown in Fig. 5 (10)

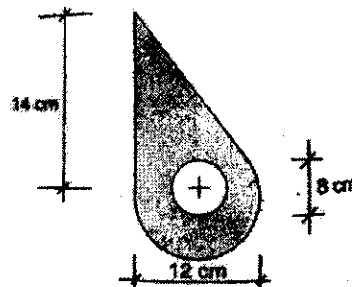


Fig. 5

- 13 A rectangular hole is made in a triangular section as shown in Fig 6. Determine the M.I. of the section about x-x axis passing through the CG of the section and (10)

parallel to BC. Also find the M.I, with respect to BC.

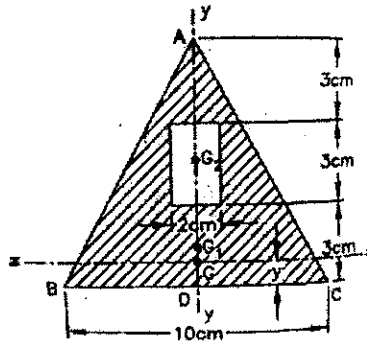


Fig.6

- 14 A uniform ladder of weight 850N and of length 6m rests on a horizontal ground and leans against a smooth vertical wall. The angle made by the ladder with the horizontal is  $65^\circ$ . When a man of weight 750N stands on the ladder at a distance 4m from the top of the ladder, the ladder is at the point of sliding. Determine the co-efficient of friction between the ladder and the floor. (10)

### SET III

*Each question carries 10 marks*

- 15 a) A cylindrical roller, 50cm in diameter, is in contact with two horizontal conveyor belts running at uniform speeds of 5m/s and 3m/s as shown in Fig. 7. Assuming that there is no slip at the points of contact, determine, (5)
- the position of the instantaneous centre of the roller,
  - the linear velocity of the centre C, and
  - the angular velocity of the roller.

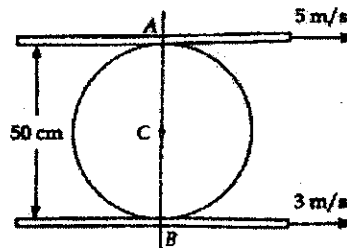


Fig. 7

- b) Determine the three parameters asked in the previous question, if the velocities of the belts are in opposite direction. (5)
- 16 A mass of 60kg is supported by two springs of stiffnesses 6kN/m and 8kN/m. The springs are arranged in series. The mass is given an initial displacement of 40mm and the released. Determine the period of vibration, the maximum velocity and maximum acceleration. (10)
- 17 a) A reciprocating pump plunger is driven by a crank of radius 30cm which is rotating at 120rpm. Assuming SHM for the plunger, find out the velocity and acceleration of the plunger when it is at 15cm from either end of the stroke. (5)
- b) Find out the maximum force required to push the plunger in the previous question, if the mass of the plunger is 10kg. (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: BE101-03**

**Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING**

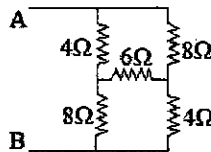
Max. Marks: 100

Duration: 3 Hours

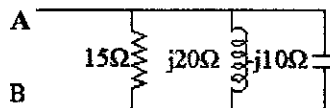
**PART A**

*Answer all questions, each carries 4 marks.*

- 1 Differentiate between self-inductance and mutual inductance. What is meant by Coupling coefficient? (4)
- 2 State and explain Kirchhoff's current and voltage laws with the help of neat diagram. (4)
- 3 Find the equivalent resistance  $R_{AB}$  (4)



- 4 Compare electric and magnetic circuits in terms of any two similarities and two differences. (4)
- 5 Find equivalent impedance of the circuit shown in figure (4)



- 6 Draw the phasor diagram showing the following voltages  $v_1 = 100\sin(500t)$ ,  $v_2 = 200\sin(500t+45^\circ)$ ,  $v_3 = -50\cos(500t)$ . Also find the expression of resultant voltage of the three. (4)
- 7 What is meant by resonance in electric circuit? Write the expression for resonance frequency of a series RLC circuit. (4)
- 8 With the help of an RLC circuit explain the concept of complex power and power factor. (4)
- 9 Calculate the phase and line values of voltage and current in a 3-phase star connected balanced network with phase impedance  $(6+j10)\Omega$  and supply voltage 100 V, 50 Hz. (4)
- 10 Derive the relation between phase values of current and voltage of a delta connected 3 phase circuit to the line values with the help of phasor diagram. (4)

**PART B**

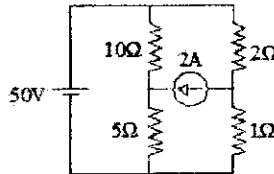
*Answer any four full questions, each carries 10 marks.*

- 11 a) State Faraday's laws of electromagnetic induction and differentiate between statically and dynamically induced emfs. (4)
- b) Two coils A and B 600 and 100 turns respectively are wound uniformly around a wooden ring of mean circumference 80 cm. The cross-sectional area of the ring is  $4\text{cm}^2$ . Calculate self-inductance of each coil, mutual inductance between coils, emf induced in the coil B when a current of 2A in coil A is reversed in 0.01 second. (6)

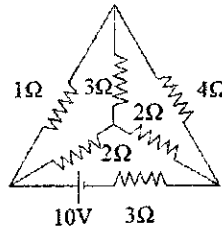
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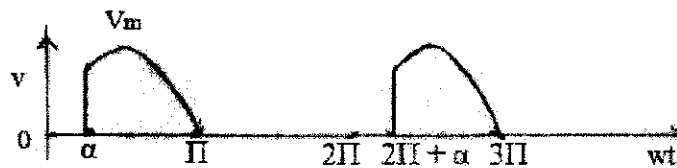
- 12 a) Derive the expression for energy stored in an inductor. (4)  
 b) Find the values of branch currents in the circuit shown below using mesh analysis. (6)



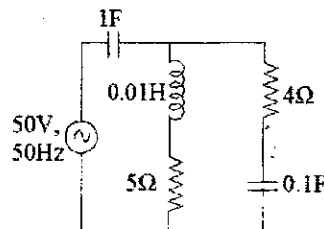
- 13 a) Differentiate between ideal and real current sources with the help of terminal V-I characteristics and circuit representations. (4)  
 b) Find the branch currents in the circuit shown below using node analysis. (6)



- 14 a) Define the terms - mmf, flux, reluctance and permeability. (4)  
 b) A steel ring, 30 cm mean diameter, has an air gap of 1mm long. It is wound uniformly with 600 turns of wire carrying a current of 2.5 A. Neglect magnetic leakages. The iron path has about 40% of the total mmf. Estimate the values of mmf in air gap, magnetic flux in iron path, reluctance of iron path and flux density in air gap. (6)
- 15 a) What is meant by the terms rms value, average value, peak factor and form factor in connection with periodic waveforms. (4)  
 b) Find the average value rms value and form factor of the sinusoidal voltage shown in figure, where  $V_m = 100V$ ,  $\alpha = \pi/4$  (6)



- 16 a) Prove that the current through a pure inductor lags  $90^\circ$  the sinusoidal voltage applied across it. (4)  
 b) Calculate the branch currents in the circuit shown below. (6)



D

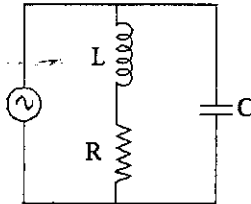
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**PART C**

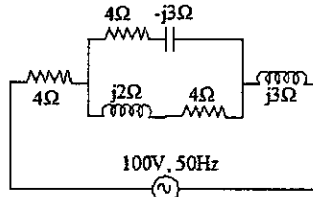
*Answer any one full question from each module, each carries 10 marks.*

**Module V**

- 17 a) Define the terms band width and quality factor. Explain the significance of both. (4)  
b) Derive the resonance frequency of the circuit shown below. (6)



- 18 a) Point out any four differences of series and parallel resonance. (4)  
b) Calculate the real power, reactive power, apparent power and power factor of the circuit. (6)



**Module VI**

- 19 a) List the advantages of 3 phase ac over single phase ac. (4)  
b) A 3 phase 4 wire star connected load of phase impedances  $Z_1 = (16 + j12) \Omega$ ,  $Z_2 = (14 - j21) \Omega$  and  $Z_3 = 25 \Omega$  is connected across a 254 V, 50 Hz ac supply. Calculate the current in each phase of the load and power consumed by the load. (6)
- 20 a) Describe how the two watt meter method is used for real and reactive power measurement in a 3phase 3 wire circuit. (6)  
b) A 3 phase balanced load connected across a 3 phase 400V ac supply draws a line current of 10 A. Two wattmeters are used to measure input power. The ratio of two wattmeter readings is 2:1. Find the readings of the two wattmeters. (4)

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Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: BE101-04**

**Course Name: INTRODUCTION TO ELECTRONICS ENGINEERING**

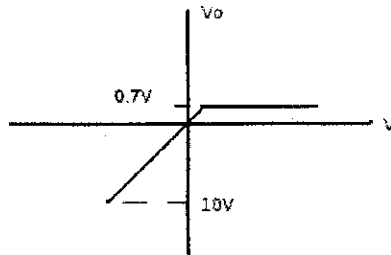
Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 5 marks.*

- |   |   | Marks |
|---|---|-------|
| 1 | Explain the constructional details of carbon composition resistors. Mention its features.                     | (5)   |
| 2 | Explain the V-I characteristics of a PN junction diode. How temperature influences the diode characteristics. | (5)   |
| 3 | Compare CE, CB and CC configurations of transistor.   | (5)   |
| 4 | Briefly explain the V-I characteristics of SCR.   | (5)   |
| 5 | Draw the circuit diagram for the given transfer characteristics and explain its working.                      | (5)   |



- |   |  |     |
|---|--|-----|
| 6 | With a neat diagram explain the working of a capacitor filter. | (5) |
| 7 | Briefly explain the block diagram of function generator.       | (5) |
| 8 | Explain any three performance parameters of instruments.       | (5) |

**PART B**

*Answer six questions, one full question from each module and carries 10 marks.*

**Module I**

- |   |  |     |
|---|--|-----|
| 9 | a) Explain with necessary diagrams, construction, working and applications of electrolytic capacitors. | (5) |
|   | b) Discuss any two types of variable resistors.  | (5) |

**OR**

- |    |   |     |
|----|---|-----|
| 10 | a) With suitable diagram, describe the working of an electromechanical relay. | (5) |
|    | b) Compare the electrical behaviour of capacitors and inductors.              | (5) |

**Module II**

- |    |   |     |
|----|---|-----|
| 11 | a) Discuss the formation of "barrier potential" in a PN junction. | (5) |
|    | b) Explain the working principle of LED.                          | (5) |

**OR**

- |    |   |     |
|----|---|-----|
| 12 | a) Differentiate between zener and avalanche breakdown. | (5) |
|----|---|-----|



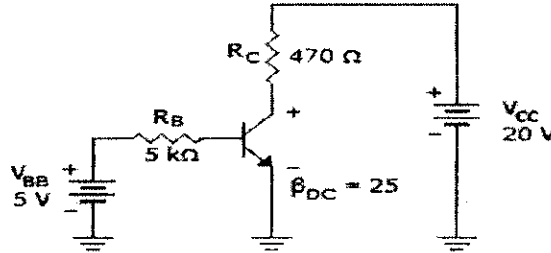
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- b) Draw the piece-wise linear model of diode and explain. (5)

**Module III**

- 13 a) Explain the output characteristics of transistor in CE configuration and 3 regions of operation. (5)  
b) Determine the operating point for the above circuit. (5)



**OR**

- 14 a) With a neat circuit diagram, explain the working of RC coupled amplifier. (7)  
b) Explain the need for biasing and stabilisation of transistors. (3)

**Module IV**

- 15 Explain the construction and principle of operation of an enhancement type MOSFET with its V-I characteristics. (10)

**OR**

- 16 With the aid of V-I characteristics, explain the working of N-channel JFET. (10)

**Module V**

- 17 a) Derive the expressions for  $I_{rms}$ ,  $I_{dc}$ , ripple factor and rectification efficiency of a half wave rectifier. (7)  
b) Draw the circuit to clamp a sine wave of 20Vp-p positively at 5V. (3)

**OR**

- 18 a) The input voltage applied to the primary of a 4:1 step down transformer of a full-wave center-tap rectifier is 230V, 50Hz. If the load resistance is 600Ω and forward resistance is 20Ω. Determine dc power output, rectification efficiency and PIV. (7)  
b) Explain how a zener diode can be used as voltage regulator. (3)

**Module VI**

- 19 a) With a neat block diagram explain the working of a CRO. (7)  
b) Explain the uses of CRO as a measuring instrument. (3)

**OR**

- 20 a) With a neat block diagram, explain the working of a DSO. (7)  
b) Draw the block diagram of digital multimeter and explain. (3)

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Reg No.: \_\_\_\_\_

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: BE101-05**

**Course Name: INTRODUCTION TO COMPUTING AND PROBLEM SOLVING**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions.*

- |    |  | Marks |
|----|--|-------|
| 1  | What is the purpose of a translator? Explain the different types of translators.   | (3)   |
| 2  | Write an algorithm for finding the largest and smallest of N numbers.  | (3)   |
| 3  | What do you mean by cache memory?  | (2)   |
| 4  | Draw the flowchart for finding the sum of all even numbers between 1 and N   | (3)   |
| 5  | Identify all the invalid variable names from the following. Also give the reason<br>(i) 2sum (ii) _sum@ (iii) for (iv) fori  | (2)   |
| 6  | What will be the output of the following expressions in python<br>i) 2*3**2 ii) 2**3**2  | (2)   |
| 7  | Write a python function that will accept three arguments x , y and z. Find x+y and if the sum is greater than z, return the square root of (x <sup>2</sup> +y <sup>2</sup> ). Otherwise return -1  | (3)   |
| 8  | What is the difference between type conversion and type coercion? Explain with example.  | (3)   |
| 9  | What will be the output of the following code<br>for number in range(30,20,-2):<br>number = number + 5<br>print number   | (3)   |
| 10 | Suppose S="mary had a little lamb". Write the python code to<br>i) Replace "lamb" with "kid"<br>ii) Find starting index of substring "had" in the string S .                                       | (2)   |
| 11 | Let data=[23,56,67,2,[6,7,12],123]. Write the expressions for following operations in Python:<br>i) Replace the value 67 with 89<br>ii) Print the value 12.<br>iii) Remove the value 56 from list. | (3)   |
| 12 | Let t=('a','b','c',1,2,3). Write a python code to print the values in reverse order.   | (2)   |
| 13 | How can you create a fresh copy of a dictionary? Explain with example.   | (2)   |
| 14 | What is the advantage of using pickling? Explain the "dump" and "load" methods associated with it.   | (3)   |
| 15 | Explain with example the difference between read() and readline() functions associated with files in python.   | (2)   |
| 16 | Describe the different modes used for file operations.   | (2)   |

**PART B***Answer any four full questions, each carries 8 marks.*

- 17 a) What are the different types of RAM? Give brief explanation. (4)  
 b) Design an algorithm for generating the following series (4)  
 (1, 3, 4, 7, 11, .....)
- 18 a) Explain the instruction cycle of a CPU with a neat diagram. (4)  
 b) Draw a flowchart for finding sum of the digits of a number, N. (4)
- 19 a) Describe recursion with one example. (4)  
 b) What is a system software? Explain its uses with examples. (4)
- 20 Write a python program to find the sum of cosine series  $(1-x^2/2!+x^4/4!-x^6/6!.....N \text{ terms})$ . Use a function *fact* to find the factorial of a number. (8)
- 21 a) Write a Python program to calculate the hypotenuse of a right-angled triangle. (2)  
 b) Explain the logical operators in python with example? (3)  
 c) Write Python code to check whether a number is prime or not. (3)

**PART C***Answer any two full questions, each carries 14 marks.*

- 22 a) Write a python program to input a sentence and find the number of words in the sentence and print each word in uppercase. Also print the number of question marks (?), periods(.) and commas(,) present in the string. (7)  
 b) Write a Python program to input a list of n numbers. Calculate and display the sum of cubes of each value in the list. (5)  
 c) What are the operations associated with a list? Explain with examples. (2)
- 23 a) What is the difference between a list and a tuple? (3)  
 b) Describe the exceptions in python with examples. (4)  
 c) Explain the data structure, dictionary in Python using an example. How does the Dictionary operations- “del” , “len” , “keys” , “items” and “has\_key” operations work. Explain with examples. (7)
- 24 a) Write a Python program to read numbers from a file named, *num.txt*. Write all positive numbers from *num.txt* to file named *positive.txt* and all negative numbers to another file named *negative.txt*. (7)  
 b) Explain the terms class, object and attributes. Create a class Employee with attributes name, age and salary. Write a method *printdetails()* for displaying the same. Create two instances of the class and call the method for each instance. (7)

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Reg. No.: \_\_\_\_\_

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: BE101-02**

**Course Name: INTRODUCTION TO MECHANICAL ENGINEERING SCIENCES**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two questions, each carries 15 marks.*

Marks

- |   |   |     |
|---|---|-----|
| 1 | a) Differentiate between intensive and extensive properties. Categories the following properties into intensive or extensive.<br>i) Pressure ii) Energy iii) Volume iv) Specific entropy  | (4) |
|   | b) Write the two statements for second law of thermodynamics along with the applications.   | (4) |
|   | c) Explain the working of two stroke - petrol engine with neat diagrams.  | (4) |
|   | d) What are the applications of air compressors?  | (3) |
| 2 | a) What is irreversibility? Explain the causes of irreversibility.  | (5) |
|   | b) What is entropy? Explain the principle of increase of entropy.   | (4) |
|   | c) If the availability of water is less and head is large. Suggest the name of turbine to be installed at that site. With neat sketch explain the components and working of that turbine. | (6) |
| 3 | a) What is a Carnot engine? Explain its significance with Carnot cycle.   | (4) |
|   | b) Differentiate between impulse and reaction steam turbines.   | (4) |
|   | c) What is the principle behind rocket propulsion? Mention any two significant events in Indian space programme.  | (3) |
|   | d) Differentiate between SI and CI engines.   | (4) |

**PART B**

*Answer any two questions, each carries 15 marks.*

- |   |  |     |
|---|--|-----|
| 4 | a) What are the applications of refrigeration in process and chemical industries?            | (4) |
|   | b) Define the following: i) Humidity ratio ii) Relative humidity iii) Dew point temperature. | (3) |
|   | c) Write any 4 types of classification of automobiles with examples for each type.           | (4) |
|   | d) Explain the aerodynamic forces with their significance in flight of a body.               | (4) |
| 5 | a) Differentiate between refrigeration and air conditioning.                                 | (3) |
|   | b) Explain summer air conditioning and winter air conditioning with diagrams.                | (5) |
|   | c) Mention any four important automobile manufacturers in India and their products.          | (4) |
|   | d) What are COP of refrigeration and unit of refrigeration?                                  | (3) |
| 6 | a) What is psychrometry? Explain its significance with the help of psychrometric chart.      | (4) |
|   | b) Write the major components of automobiles with their functions.                           | (6) |
|   | c) With schematic diagram explain any two types of aircraft engines with their applications. | (5) |

## PART C

*Answer any two questions, each carries 20 marks.*

- 7 a) Explain the following crystallographic structures. i) BCC and ii) FCC (6)  
b) Define the following: (5)  
i) Hardness ii) Toughness iii) Creep iv) Fatigue v) Stiffness
- c) Differentiate between Soldering and brazing. (4)  
d) Name and explain any four operations on lathe. (5)
- 8 a) How engineering materials are classified. Give two examples for each. (5)  
b) List any four destructive material testing methods and explain their purpose. (6)  
c) What is extrusion? Explain different types of extrusion processes. (5)  
d) List the advantages of CNC machining over conventional machining. (4)
- 9 a) What are ceramics and composites? Give examples for each and their uses. (6)  
b) Draw the stress-strain diagram for mild steel and mark the salient points. (4)  
c) With neat sketch explain any four types of forging operations. (6)  
d) Differentiate between operations done in planer and shaper machines. (4)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: BE101-01**

**Course Name: INTRODUCTION TO CIVIL ENGINEERING**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 1 mark.*

		Marks
1	List any four types of civil engineering structures.	(1)
2	List any four methods of quarrying of stones	(1)
3	What is meant by 43 grade cement?	(1)
4	In which type of construction zig zag bond is used?	(1)
5	List any four types of steel used in building construction.	(1)
6	List any four types of roof covering materials used for pitched roof.	(1)

**PART B**

*Answer all questions, each carries 5 marks.*

7	List out the general classification of buildings according to NBC (Description is not required). Classify the below buildings (Subdivision should be taken into account). Factory, Nuclear plant, Garage, Cinema theatre, Hospitals, Regular school building.	(5)
8	Describe any two tests on building stone with IS specification.	(5)
9	What are the ingredients of cement? What is their relevance in quality of cement?	(5)
10	What are the advantages and disadvantages of stone masonry over brick masonry?	5
11	Sketch and explain any six types of defects in timber. How it will affect the quality of timber?	(5)
12	Describe any four types of floor covering materials. Indicate under what situations these can be used.	(5)

**PART C****Module I & II**

*Answer any three full questions, each carries 6 marks.*

13	With a neat sketch mark the different components of a building and indicate the function of each one.	(6)
14	What are the different types of roofing tiles? Explain the different steps involved in the manufacturing of roofing tiles.	(6)
15	a) What is meant by setting out of a building? Explain the process of setting out for constructing a building	(4)
	b) List the different tests for determining the quality of brick. Explain any two with IS specification.	(2)
16	a) Differentiate between Chimneys and Silos.	(2)
	b) What is meant dressing of stones? Explain any four methods.	(4)

**Module III & IV**

*Answer any three full questions, each carries 6 marks.*

- 17 Name the different lab tests on cement. Explain the determination of setting time of cement with IS specification. Mention any two field tests also. (6)
- 18 Draw the plan, section and elevation of two consecutive courses of one and a half brick thick wall in English bond. (6)
- 19 a) Explain the procedure for the determination of aggregate crushing value with IS specification. (3)
- b) Differentiate between dry rubble masonry and polygonal masonry with necessary sketches. (3)
- 20 a) List the different types of mortar. Explain the preparation of cement mortar. (3)
- b) Differentiate between header bond and stretcher bond with necessary sketches. (3)
- For which type of construction this can be used.

**Module V & VI**

*Answer any four full questions, each carries 7 marks.*

- 21 a) Explain the process of manufacturing of particle board. (3)
- b) Explain any four types of steel with their uses. (4)
- 22 What is meant by seasoning of timber. Explain the different methods of artificial seasoning. (7)
- 23 Draw a neat sketch of a sloping roof and mark the different parts. Under what situations this can be used (7)
- 24 a) What are the factors affecting the selection of floor covering materials. (4)
- b) List any three types of floor covering materials. State under what type of building these are used. (3)
- 25 a) Explain any two types of timber products available in the market with their uses. (4)
- b) Differentiate between flat roof and sloping roof. (3)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION DECEMBER 2017**

**Course Code: BE110**

**Course Name: ENGINEERING GRAPHICS**

Max. Marks: 50

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 10 marks.*

- 1 A straight line PQ is 100 mm long. The end P is in HP and 20 mm in front of VP. The line PQ is inclined at  $30^\circ$  to the HP and  $20^\circ$  to VP. Draw the projections of the line if the end Q is in second quadrant. (10)
- 2 The line AB measuring 60 mm has its VT 15 above HP. The end B is 30 mm above HP and 35 mm in front of VP. The projectors through B and VT are 80 mm apart. Draw the projection and find the inclination of the line with HP and VP. (10)
- 3 Draw projections of a cone of base diameter 30mm and height 40 mm resting on HP on its generator with top view of axis inclined  $30^\circ$  to VP (10)

**PART B**

*Answer any three full questions, each carries 10 marks.*

- 4 A vertical cylinder of base diameter 40 mm and height 35 mm is resting on ground. A sphere of diameter 20 mm resting centrally over the top face of cylinder. Draw the isometric view of combination. (10)
- 5 A square prism having base of side 30 mm, is cut by a sectional plane such that the true shape is a hexagon having two opposite sides 25 mm long and the remaining four sides 40 mm long. Draw top view, front view and true shape. Determine the height of the prism. (10)
- 6 A hexagonal prism of 20 mm base and 60 mm height resting on its base on HP such that two base edges are perpendicular to VP. It is cut by a surface which is inclined at  $30^\circ$  to HP and perpendicular to VP. This plane passing through the midpoint of the axis of the prism. Draw the development of bottom portion (10)
- 7 A horizontal cylinder of 40 mm diameter penetrates a vertical cylinder of 60 mm diameter resting on HP. The two axes are coplanar. Draw the projections showing the curve of the intersection (10)
- 8 Draw the perspective view of a square prism of base side 30mm and height 60mm resting on its base with one of the base edges 10mm behind and parallel to PP. The Central Plane is passing through the axis of prism and SP is located 50mm in front of PP and 40 mm above GP. (10)

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Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: CY100**

**Course Name: ENGINEERING CHEMISTRY**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each question carries 2 marks*

- |   |   |   |
|---|---|---|
| 1 | Calculate the fundamental vibrational frequency HCl molecule, if the value of force constant of the molecule is $483 \text{ Nm}^{-1}$ . The atomic masses are $^1\text{H} = 1.673 \times 10^{-27} \text{ kg}$ and $^{35}\text{Cl} = 58.06 \times 10^{-27} \text{ kg}$ . | 2 |
| 2 | Represent electrode reactions at different electrodes of a Li-ion cell during discharging.  | 2 |
| 3 | Distinguish between retention factor and retention time in chromatography   | 2 |
| 4 | What is ABS? How is it prepared?  | 2 |
| 5 | Define a) Octane number and b) Cetane number.   | 2 |
| 6 | Calculate the theoretical GCV of a petroleum fuel with composition C= 84%, H= 15%, O= 0.4%, N= 0.3% and S=0.3%  | 2 |
| 7 | Give the principle of reverse osmosis?  | 2 |
| 8 | Calculate the BOD of a water sample containing 75 mg of carbohydrate ( $\text{CH}_2\text{O}$ ) per litre.   | 2 |

**PART B**

*Answer all questions, each question carries 3 marks*

- |    |   |   |
|----|---|---|
| 9  | State and explain Beer- Lamberts law. Mention any two limitations of the law.   | 3 |
| 10 | A zinc rod is dipped 0.3 M $\text{CuSO}_4$ solution. Displacement reactions take place and allowed to attain equilibrium. Find the equilibrium constant of the reaction. [Given that $E^{\circ}_{\text{Cu}^{2+}/\text{Cu}} = +0.34\text{V}$ and $E^{\circ}_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{V}$ .                                | 3 |
| 11 | Explain the visualisation techniques in TLC.  | 3 |
| 12 | Explain the synthesis and applications of polypyrrole.  | 3 |
| 13 | On burning 0.75g of fuel in a bomb calorimeter, the temperature of 2000g of water increases from $27.0^\circ\text{C}$ to $29.8^\circ\text{C}$ . The water equivalent of calorimeter and latent heat of steam are 385.0g and 587.0 cal/g respectively. If the fuel contains 0.9% hydrogen, calculate its gross and net calorific values. | 3 |
| 14 | Write a short note on biodiesel.  | 3 |
| 15 | Illustrate break point chlorination with the help of suitable graph. Give any two advantages of break point chlorination.   | 3 |
| 16 | Briefly explain the UASB process for sewage water treatment.  | 3 |

**PART C**

*Each question carries 10 marks.*

- |    |  |   |
|----|--|---|
| 17 | a) Outline the principles of IR spectroscopy.                                  | 5 |
|    | b) How will you distinguish ethanol and dimethyl ether using NMR spectroscopy? | 5 |

**B**

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OR

- 18 a) Define chemical shift in NMR spectroscopy. Also explain the factors influencing chemical shift. 5  
b) Discuss the possible electronic transitions in acetaldehyde. 5
- 19 a) Outline the setting up of a calomel electrode with a neat diagram. 5  
b) How will you employ the calomel electrode for the determination of electrode potential of copper and zinc? 5

OR

- 20 a) Explain the working and electrode reactions in H<sub>2</sub>-O<sub>2</sub> fuel cells. 5  
b) Give the procedure for potentiometric estimation of an alkali using a standard acid. 5
- 21 Explain the principles, instrumentation, working and applications of TGA. 10

OR

- 22 Explain the principles, instrumentation, working and applications of HPLC. 10
- 23 a) Briefly outline chemical synthesis of nanoparticles. 5  
b) What are conducting polymers? Briefly explain their classification. 5

OR

- 24 a) Discuss the classification of nanomaterials. 5  
b) Outline the preparation, properties and application of silicone rubbers. 5
- 25 Discuss the determination of calorific value of a fuel using a bomb calorimeter. 10

OR

- 26 a) What are lubricants? How are they classified? 5  
b) Briefly outline following properties of lubricants a) viscosity index b) flash and fire points. 5
- 27 Describe the EDTA method for determination of Hardness of water. 10

OR

- 28 a) What is meant by COD? How it is determined? Explain its significance in sewage treatment. 5  
b) A sample of water on analysis gave the following results: Ca<sup>2+</sup> = 200 mg/L, Mg<sup>2+</sup> = 180 mg/L, HCO<sub>3</sub><sup>-</sup> = 360 mg/L, Na<sup>+</sup> = 80 mg/L and Cl<sup>-</sup> = 200 mg/L. Calculate the temporary, permanent and total hardness of the sample. 5

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Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: PH100**

**Course Name: ENGINEERING PHYSICS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions. Each question carries 2 marks*

- |    |   | Marks |
|----|---|-------|
| 1  | What is meant by amplitude resonance? Give any two examples.                              | (2)   |
| 2  | Define frequency and wavelength of a wave.  | (2)   |
| 3  | What are non reflecting films?  | (2)   |
| 4  | Compare interference and diffraction of light.  | (2)   |
| 5  | What is Kerr effect? Give the equation.   | (2)   |
| 6  | Write down four important applications of Super conductors.                               | (2)   |
| 7  | What is tunnelling effect?  | (2)   |
| 8  | Define phase space.   | (2)   |
| 9  | Define intensity of sound .Give the values of threshold of hearing and threshold of pain. | (2)   |
| 10 | What is meant by non destructive testing (NDT)? Name an NDT technique?                    | (2)   |
| 11 | Define the terms population inversion and meta stable level.                              | (2)   |
| 12 | What is an LED? Give its working principle.   | (2)   |

**PART B**

*Answer any 10 questions. Each question carries 4 marks*

- |    |   |     |
|----|---|-----|
| 13 | The frequency of a tuning fork is 250 Hz and its Q-factor is $4 \times 10^4$ . Find the relaxation time. Also calculate the time after which its energy becomes $1/10$ of its initial undamped value.                               | (4) |
| 14 | a Obtain the differential equation of the oscillation of an electric circuit.   | (2) |
|    | b Compare it with mechanical oscillator.  | (2) |
| 15 | a What is Rayleigh's criterion for spectral resolution?   | (2) |
|    | b Obtain the expression for resolving power of a plane transmission grating.  | (2) |
| 16 | What is the higher order spectrum which may be obtained with a light of wavelength $5500 \text{ \AA}$ using a plane transmission grating having 4500 lines per cm.  | (4) |
| 17 | The refractive indices of Quartz for light of wavelength $5890 \text{ \AA}$ are 1.5539 for ordinary ray and 1.5634 for extra ordinary ray. Calculate the required thickness of the Quartz crystal for making a) a QWP and b) a HWP. | (4) |
| 18 | a What is Meissner effect?  | (2) |
|    | b What are Type I and Type II Superconductors (any two points)?   | (2) |
| 19 | a What are the important postulates of Bose-Einstein Statistics?  | (3) |
|    | b Write down the distribution equation of BE Statistics.  | (1) |
| 20 | State Uncertainty principle. Using this principle calculate the uncertainty in frequency of the emitted radiation if the uncertainty in time of an excited atom is  | (4) |

$5 \times 10^{-8}$  s.

- 21 The volume of a hall is  $6000 \text{ m}^3$ . It has a total absorption of  $150 \text{ m}^2$  sabin. If the hall is filled with audience who add another  $80 \text{ m}^2$  sabin, find the difference in reverberation time. (4)
- 22 An ultrasonic source of  $0.085 \text{ MHz}$  sends down a pulse towards the sea water which returns after  $0.6$  sec. The velocity of sound in water is  $1800 \text{ m/s}$ . Calculate the depth of the sea and wavelength of pulse. (4)
- 23 With the help of a diagram explain how a hologram is recorded? (4)
- 24 Give any four advantages of optical fibre over conventional transmission lines? (4)

### PART C

*Answer any three questions. Each question carries 6 marks*

- 25 Considering transverse vibrations of a stretched string derive one dimensional wave equation. (6)
- 26 a Draw the neat diagram of air wedge experiment. (2)  
b Derive an expression for the bandwidth of the interference fringes using this arrangement. (4)
- 27 Given two Nicol prisms and a Quarter wave plate. How can we produce and analyse plane, circularly and elliptically polarized light. (6)
- 28 Starting from the time dependent equation, derive Schrodinger's time independent wave equation. (6)

### PART D

*Answer any three questions. Each question carries 6 marks*

- 29 Define Reverberation and Reverberation time. (6)  
What is the significance of Reverberation time? Compare Reverberation and Echo.
- 30 a What is inverse piezoelectric effect? (2)  
b Describe the method of producing ultrasonic waves using this effect. (4)
- 31 a Draw the energy level diagram and explain the working of He-Ne laser. (5)  
b What are the important applications of He-Ne Laser? (1)
- 32 a Define numerical aperture and fibre acceptance angle of an optic fibre. (2)  
b Derive an expression for numerical aperture (NA) of a step index fibre. (4)

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Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017**

**Course Code: MA101**

**Course Name: CALCULUS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 5 marks.*

- |   |   | Marks |
|---|---|-------|
| 1 | a) Test the convergence of the series $\sum_{k=1}^{\infty} \frac{1}{\sqrt[3]{2k-1}}$ .  | (2)   |
|   | b) Find the radius of convergence of $\sum_{n=1}^{\infty} \frac{x^n}{2n+3}$ .   | (3)   |
| 2 | a) Find the Slope of the surface $z = xe^{-y} + 5y$ in the y-direction at the point (4,0).  | (2)   |
|   | b) Find the derivative of $z = \sqrt{1+x-2xy^4}$ with respect to $t$ along the path $x = \log t, y = 2t$ .                                    | (3)   |
| 3 | a) Find the directional derivative of $f = x^2y - yz^3 + z$ at $(-1, 2, 0)$ in the direction of $a = 2i + j + 2k$ .                           | (2)   |
|   | b) Find the unit tangent vector and unit normal vector to $r(t) = 4 \cos t i + 4 \sin t j + t k$ at $t = \frac{\pi}{2}$ .                     | (3)   |
| 4 | a) Evaluate $\int_0^{\log 3} \int_0^{\log 2} e^{x+2y} dy dx$ .  | (2)   |
|   | b) Evaluate $\iint_R xy dA$ , where R is the region bounded by the curves $y = x^2$ and $x = y^2$ .   | (3)   |
| 5 | (a) Find the divergence and curl of the vector $F(x, y, z) = yz i + xy^2 j + yz^2 k$ .  | (2)   |
|   | (b) Evaluate $\int_C (3x^2 + y^2) dx + 2xy dy$ along the circular arc C given by $x = \cos t, y = \sin t$ for $0 \leq t \leq \frac{\pi}{2}$ . | (3)   |
| 6 | (a) Use line integral to evaluate the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ .                                  | (2)   |
|   | (b) Evaluate $\int_C (x^2 - 3y) dx + 3x dy$ , where C is the circle $x^2 + y^2 = 4$ .   | (3)   |

**PART B**

**Module 1**

*Answer any two questions, each carries 5 marks.*

- |   |   |     |
|---|---|-----|
| 7 | Test the convergence or divergence of the series $\sum_{n=1}^{\infty} \left(\frac{n}{n+1}\right)^{n^2}$ . | (5) |
|---|---|-----|

8 Test the absolute convergence of  $\sum_{k=1}^{\infty} (-1)^{k+1} \frac{(2k)!}{(3k-2)!}$ . (5)

9 Find the Taylor series for  $\frac{1}{1+x}$  at  $x=2$ . (5)

**Module 11**

*Answer any two questions, each carries 5 marks.*

10 Find the local linear approximation L to  $f(x, y) = \log(xy)$  at P(1,2) and compare the error in approximating f by L at Q(1.01, 2.01) with the distance between P and Q. (5)

11 Let  $w = 4x^2 + 4y^2 + z^2$ ,  $x = \rho \sin \phi \cos \theta$ ,  $y = \rho \sin \phi \sin \theta$ ,  $z = \rho \cos \phi$ . Find  $\frac{\partial w}{\partial \rho}$ ,  $\frac{\partial w}{\partial \phi}$  and  $\frac{\partial w}{\partial \theta}$ . (5)

12 Locate all relative extrema and saddle points of  $f(x, y) = 4xy - x^4 - y^4$ . (5)

**Module 111**

*Answer any two questions, each carries 5 marks.*

13 Find the equation of the tangent plane and parametric equation for the normal line to the surface  $x^2 + y^2 + z^2 = 25$  at the point (3,0, 4). (5)

14 A particle is moving along the curve  $r(t) = (t^3 - 2t)i + (t^2 - 4)j$  where  $t$  denotes the time. Find the scalar tangential and normal components of acceleration at  $t=1$ . Also find the vector tangential and normal components of acceleration at  $t=1$ . (5)

15 The graphs of  $r_1(t) = t^2i + tj + 3t^3k$  and  $r_2(t) = (t-1)i + \frac{1}{4}t^2j + (5-t)k$  are intersect at the point P(1,1,3). Find, to the nearest degree, the acute angle between the tangent lines to the graphs of  $r_1(t)$  &  $r_2(t)$  at the point P(1,1,3). (5)

**Module 1V**

*Answer any two questions, each carries 5 marks.*

16 Change the order of integration and evaluate  $\int_0^1 \int_{4x}^4 e^{-y^2} dy dx$ . (5)

17 Use triple integral to find the volume bounded by the cylinder  $x^2 + y^2 = 9$  and between the planes  $z = 1$  and  $x + z = 5$ . (5)

18 Find the area of the region enclosed between the parabola  $y = \frac{x^2}{2}$  and the line  $y = 2x$ . (5)

**Module V**

*Answer any three questions, each carries 5 marks.*

19 Determine whether  $F(x, y) = (\cos y + y \cos x)i + (\sin x - x \sin y)j$  is a conservative vector field. If so find the potential function for it. (5)

20 Show that the integral  $\int_{(1,1)}^{(3,3)} (e^x \log y - \frac{e^y}{x}) dx + (\frac{e^x}{y} - e^x \log x) dy$ , where  $x$  and  $y$  are positive is independent of the path and find its value. (5)

21 Find the work done by the force field  $F(x, y, z) = xyi + yzj + xzk$  on a particle that moves along the curve  $C : r(t) = ti + t^2j + t^3k$  ( $0 \leq t \leq 1$ ). (5)