

10033



C

Reg. No. :

Name :

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016

BE 100 : ENGINEERING MECHANICS

Max. Marks : 100

Duration : 3 Hours

PART - A

Answer **all** the questions. **Each** question carries 5 Marks.

(8x5=40 Marks)

1. Explain the principle of transmissibility with an example.
2. Three smooth identical spheres A, B and C are placed in a rectangular channel as shown in Fig. 1. Draw the free body diagram of each sphere.

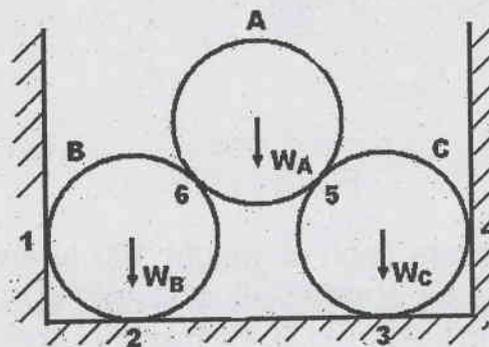


Fig. 1

3. State and prove Parallel axis theorem.
4. Define angle of friction and angle of repose. Prove that angle of repose is equal to angle of friction.
5. A lift carries a weight of 3600 N and is moving with a uniform acceleration of 3.5 m/s^2 . Determine the tension in the supporting cable when the lift is moving upward. ($g = 9.8 \text{ m/s}^2$).
6. What do you mean by instantaneous centre of rotation? How can it be located for a body moving with combined motion of rotation and translation ?

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7. Distinguish between Simple Harmonic Motion and Periodic motion.
8. Explain the types of vibrations.

PART – B

Answer **two** questions from **each** set :

SET 1 : Answer **any 2** questions. **Each** question carries **10** Marks. (2×10=20 Marks)

9. Determine the magnitude and direction of the resultant of the forces acting on the ring as shown in Fig. 2.

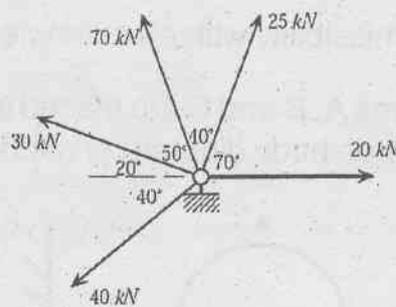


Fig. 2

10. Two smooth circular cylinders each of weight 100 N and radius 15 cm are connected at their centres by a string AB of length 40 cm and rest upon a horizontal plane as shown in below Fig. 3. The cylinder above them has a weight 200 N and radius of 15 cm. Find the force in the string AB and the pressure produced in the floor at the points of contact D and E.

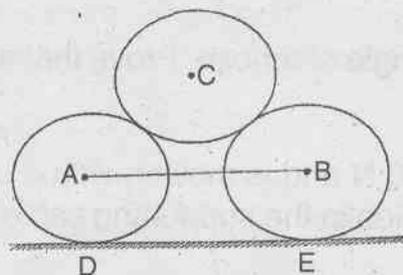


Fig. 3



11. A 5 m bar of negligible weight rests in a horizontal position on the smooth planes as shown in above Fig. 4. Determine the load P and reactions at supports.

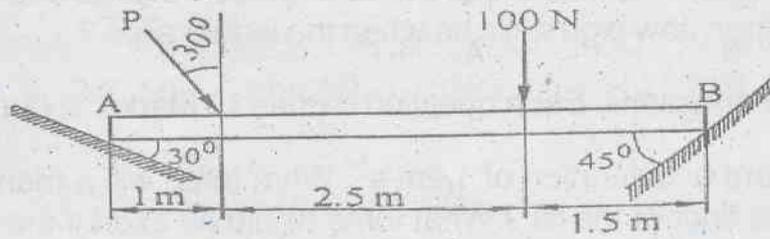
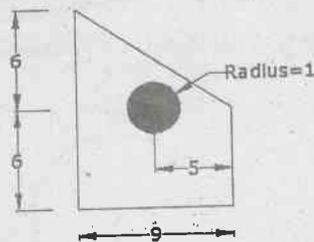


Fig. 4

SET 2 : Answer any 2 questions. Each question carries 10 Marks. (2x10 = 20 Marks)

12. a) Define radius of gyration.
b) Find the Centre of Gravity for the un-shaded composite area shown in Fig.5.



All dimensions in mm

Fig. 5

13. Determine the moments of inertia of the shaded area (Fig. 6) with respect to the x and y axes.

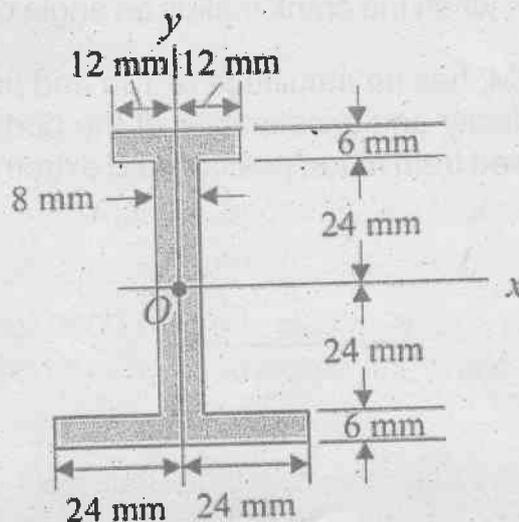


Fig. 6

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14. A uniform ladder of 4 m length rests against a vertical wall with which it makes an angle of 45° . The coefficient of friction between ladder and the wall is 0.4 and that between ladder and the floor is 0.5. If a man whose weight is one half that of ladder climbs up then how high will it be when the ladder slips ?

SET 3 : Answer any 2 questions. Each question carries 10 Marks. (2×10=20 Marks)

15. A lift has an upward acceleration of 1.2m/s^2 . What force will a man weighing 750 N exert on the floor of the lift ? What force would he exert if the lift had an acceleration of 1.2 m/s^2 downwards ? What upward acceleration would cause his weight to exert a force of 900 N on the floor ?

16.

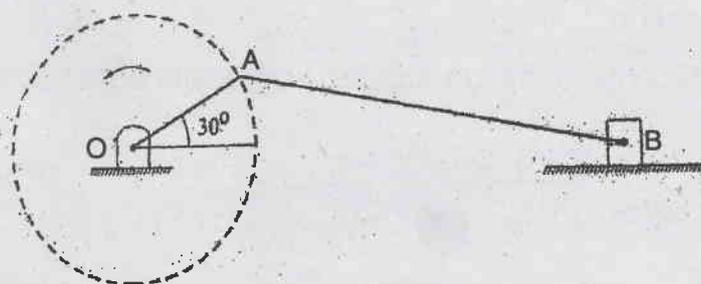


Fig. 7

In the reciprocating engine mechanism shown in Fig. 7, the crank OA rotates at a uniform speed of 300 rpm. The length of the crank and connecting rod are 12 cm and 50 cm respectively. Find the angular velocity of the connecting rod and velocity of the piston when the crank makes an angle of 30° with horizontal.

17. A body moving with SHM, has an amplitude of 1 m and period of oscillation is 2 seconds. Find the velocity and acceleration of the body at $t = 0.4$ second, when the time is measured from mean position and extreme position ?

10201



D

Reg. No. :

Name :

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016

BE 102 : DESIGN AND ENGINEERING

Max. Marks : 50

Duration : 2 Hours

Instructions : Answer **all** questions; this is an open book examination and the students are **permitted** to use text books, class notes, own notes, earlier assignments; but access to mobile phone and internet is **not allowed**.

PART – A

Each question in Part A carries 5 marks.

1. In an ordinary bicycle, name at least 6 parts that are not made of metal. Sketch any one of these parts.
2. How modular design is realized in i) Umbrella and ii) Ink Pen ? Draw the different modules involved in each of these products.
3. Design of a chair with steel tube is shown in Figure. The seat and the back rest are made of wood and are screwed on to the steel frame. Identify the interesting aspect of this design and list the number of different parts used for the chair.



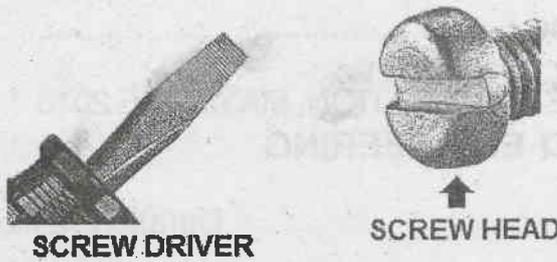
4. Devolve a questionnaire for user centered design for an automobile.
5. Considering the principle of value engineering, design a suitable product for easy cleaning of dust from windows, fans and lamp shades.

P.T.O.

10201



6. Sketches of a screw driver and a normal screw head are given below :



This screw could be tightened or loosened using the screw driver. Now design the head of such a screw that could only be tightened but not loosened by this screw driver.

PART – B

Each question in Part B carries 10 marks.

7. Without using an air-conditioner, blower or exhaust fan, design a natural system of heat removal from the rooms of a building and simultaneous inflow of fresh air from outside into the room. Prepare the necessary sketches and justify your answer.
8. Develop and sketch anyone design concept of a mechanical system to drive a generator for energy harvesting by exploiting heavy traffic.

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Reg. No. :

Name :

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016

Course Code : BE110

Course Name : ENGINEERING GRAPHICS

Max. Marks : 50

Duration : 2 Hours

PART - A

Answer any one question :

(1×11=11 Marks)

1. An 80 mm long line PQ has its end P on the HP and 15 mm in front of the V.P. The line is inclined at 30° to the HP and its top view is inclined at 60° to the reference line. Draw the projections of line PQ and determine true angle of inclination with the VP.
2. Find graphically the length of the largest rod that can be kept inside a hollow cuboid (rectangular prism) of 60 mm x 40 mm x 30 mm.

PART - B

Answer any three questions :

(3×13=39 Marks)

3. A square pyramid of base side 30 mm and axis length 60 mm is suspended by means of a string from one of its base corners with its axis parallel to VP. Draw its projections.
4. Isometric view of a cylindrical block is shown in Figure 1. Draw the front view, top view and side view from left. Take the arrow direction F as the front side.

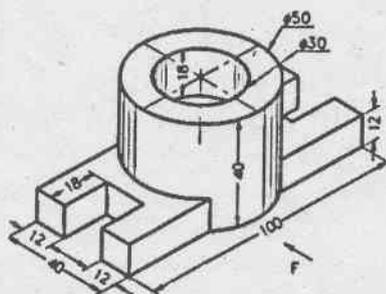


Figure 1

P.T.O.



5. A cylinder of diameter 50 mm and length of the axis 65 mm rests on its base with the axis perpendicular to the HP. It is cut by the cutting plane perpendicular to the VP, inclined at 45° to the HP and passing through a point on axis 25 mm from the top. Draw the front view, the sectional top view and the development of the lateral surface of the cylinder.
6. Draw the perspective projection of a pentagonal prism of side 25 mm and length 50 mm, lying on one of its rectangular faces on the ground plane and one pentagonal face touching the picture plane. The station point is 55 mm in front of the picture plane and lies in the central plane which is 75 mm to the left of the centre of the prism. Station point is 30 mm above the ground plane.



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F

Reg. No. :

Name :

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016

Course Code : CE 100

BASICS OF CIVIL ENGINEERING

Max. Marks : 100

Duration : 3 Hours

PART – A

Answer **all** questions. **Each** question carries **3** marks.

(10×3=30 Marks)

1. Explain very briefly about the classification of buildings based on occupancy.
2. 'Orientation is an essential step while planning a building'. Comment.
3. What are the principles of surveying ?
4. List out the commercial forms of steel available.
5. What do you mean by bearing capacity of soil ?
6. Explain the following terms related to brick masonry: Course, Queen closer & Perpend.
7. Explain how to prepare a wall surface for painting.
8. Differentiate between elevators and escalators.
9. What are the purposes of air conditioning of a building ?
10. What are the precautions taken to achieve imperviousness of water tanks ?

PART – B

Answer **any 8** questions.

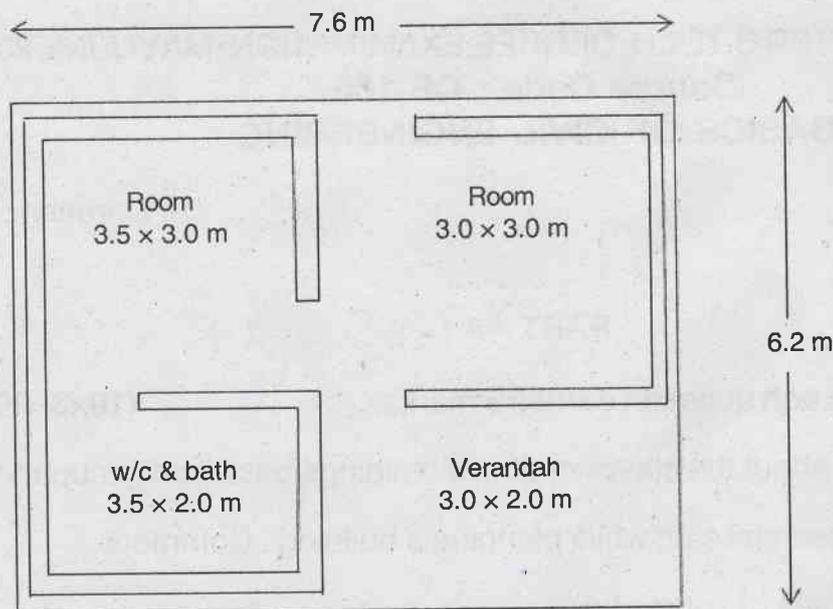
(6×8=48 Marks)

11. Write a short note on various components of a residential building and their functions.
12. Write a note on the importance of civil engineering on infrastructural development of India.

P.T.O.



13. Calculate plinth area, floor area and carpet area for the plan of a building given below: Wall thickness is 30 cm.



14. Explain the need and types of open space requirement for a building.
15. Explain the centre line method adopted for setting out of a building.
16. What is direct ranging and what are the instruments used for ranging ?
17. The following consecutive readings were taken with a dumpy level and a 4 m levelling staff on a continuously sloping ground at a common interval of 30 m: 0.585 on A, 0.930, 1.955, 2.840, 3.645, 0.960, 1.035, 1.680, 2.535, 3.845, 0.950, 1.575, 3.015 on B. The elevation of A was 520.150. The instrument was shifted at 6th and 11th readings.
- A) Rule out a page of level book and enter the above readings.
- B) Find R.L of B.
- C) Determine the gradient of line AB.
18. What is the composition of ordinary cement ? Briefly explain grades of cement.
19. Explain the preparation of concrete.
20. What are the characteristics of a good brick ?

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PART – C

Answer any 2 full questions.

21. A) Define :

- i) Span
- ii) Ridge
- iii) Eaves
- iv) Batten
- v) Cleats.

(1×5=5 Marks)

B) Describe the functions and various types of foundations.

(6 Marks)

22. A) Explain the method of applying plaster on a wall surface.

(5 Marks)

B) Explain the concept of intelligent building.

(6 Marks)

23. A) How is sound proofing done in a building ?

(5 Marks)

B) List out the specification of the following :

(6 Marks)

- i) Towers
- ii) Chimneys
- iii) Water tanks.

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B

Reg. No. :

Name :

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016

Course Code : CY100

Course Name : ENGINEERING CHEMISTRY

Max. Marks : 100

Duration : 3 Hours

PART – A

Answer all questions, each question carries 2 marks.

1. Which of the following nuclei can give NMR spectrum ? Give reason.
a) ${}^1_1\text{H}$ b) ${}^{12}_6\text{C}$ c) ${}^{19}_9\text{F}$ d) ${}^{16}_8\text{O}$
2. At 25°C the standard emf of a cell having reaction involving two electron charge is found to be 0.295 V. Calculate the equilibrium constant of the reaction.
3. The specific conductivity of N/50 KCl solution at 25°C is $0.0002765 \text{ ohm}^{-1} \text{ cm}^{-1}$. If the resistance of the cell containing this solution is 500 ohm, what is the cell constant ?
4. What are co-polymers ? Give an example.
5. Distinguish between gross and net calorific values of fuel.
6. What is meant by cetane value of a diesel fuel ?
7. Hard water will not give a ready lather with soap solution. Give the chemical explanation.
8. Why do we express hardness of water in terms of CaCO_3 equivalent ?

(8×2=16 Marks)

PART – B

Answer all questions, each question carries 3 marks.

9. The vibrational frequency of HCl molecule is 2886 cm^{-1} . Calculate the force constant of the molecule. Reduced mass of HCl is $1.63 \times 10^{-27} \text{ kg}$.

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10. What is meant by potentiometric titrations ? Mention two merits of potentiometric titrations.
11. Give the principle of column chromatography. List the various steps to be undertaken in this method.
12. Draw the structure of bifunctional silicon chloride. How silicone rubber prepared from it ?
13. An oil of unknown viscosity-index has a Saybolt universal viscosity of 58 seconds at 210°F and of 580 seconds at 100°F. The high viscosity index standard (Pennsylvanian) oil has Saybolt viscosity of 58 seconds at 210°F and 430 seconds at 100°F. The low viscosity index standard (Gulf oil) has a Saybolt universal viscosity of 58 seconds at 210°F and 780 seconds at 100°F. Calculate the viscosity index of oil sample.
14. What is natural gas ? Distinguish between LNG and CNG.
15. What is disinfection ? Give the advantages and disadvantages of UV disinfection of water.
16. A sample of water on analysis gives following results. $\text{Ca}^{2+} = 320 \text{ mg/L}$, $\text{Mg}^{2+} = 72 \text{ mg/L}$, $\text{HCO}_3^- = 610 \text{ mg/L}$, $\text{Cl}^- = 355 \text{ mg/L}$ and $\text{Na}^+ = 23 \text{ mg/L}$. Calculate the temporary and permanent hardness of water sample. **(8×3=24 Marks)**

PART – C

Each question carries 10 marks.

17. a) How can you distinguish NMR spectrum of $\text{CH}_3\text{CH}_2\text{Cl}$ and CH_3CHCl_2 applying the concept of spin-spin splitting ?
b) Which of the following molecules show UV-visible absorption ? Give reason (i) ethane (ii) butadiene (iii) benzene (iv) phenol
c) What is a spectrometer ? Write the principal components of UV-visible spectrometer. **(3+3+4)**
- OR
18. a) Predict NMR spectrum of $\text{CH}_3 - \text{CHCl} - \text{CH}_3$.
b) Write the theory of vibrational spectroscopy.
c) Sketch the various modes of vibrations possible for CO_2 . Which are IR active ? Write reason for your answer. **(3+2+5)**



19. a) What is meant by standard electrode potential ? How would you measure the single electrode potential of an electrode using a saturated calomel electrode ?
- b) Find the single electrode potential for copper metal in contact with 0.1 M Cu^{2+} solution at 298 K. $E^0 \text{Cu}^{2+}/\text{Cu} = 0.34 \text{ V}$
- c) How is glass electrode constructed ? What is its use ? (4+2+4)

OR

20. a) Write electrode reaction and expression for the electrode potential of following electrodes :
- i) Metal-metal ion electrode
 - ii) Gas electrode
 - iii) Metal-metal insoluble salt electrode
 - iv) Redox electrode.
- b) How will you explain the working of $\text{H}_2 - \text{O}_2$ fuel cell ? Draw a neat labelled diagram of the cell. (4+6)
21. a) What is thermal analysis ? List two techniques of it. Compare their principles.
- b) Write the basic components of a gas chromatographic instrument. Draw the diagram of a gas chromatograph. (6+4)

OR

22. a) Write the procedure for doing column chromatography.
- b) What is HPLC ? Draw a labelled diagram of HPLC instrument. Write its two important applications. (5+5)
23. a) What are conducting polymers ? Write the structure of two conducting polymers.
- b) Write a note on structure and applications of fullerene.
- c) Write a note on biological nanomaterials. (3+4+3)

OR

24. a) What are carbon nanotubes ? How are they classified ? State their two applications.
- b) Write the structure and two applications of Kevlar. (6+4)

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25. a) Differentiate between vegetable oil and mineral oil lubricants.
b) Write the working of a Bomb calorimeter for determining the calorific value of a solid fuel with the help of a neat diagram. (3+7)

OR

26. a) What are lubricants ? How are they classified on the basis of their physical state ? What are their important functions ?
b) Write any four desirable properties of a lubricant and indicate the significance of the properties. (5+5)
27. a) What is the main purpose of secondary sewage water treatment ? Explain trickling filter process.
b) What is desalination ? How is it performed by reverse process ? (5+5)

OR

28. a) How is UASB process useful in waste water treatment ?
b) What are the factors which governs the amount of dissolved oxygen in water ? (5+5)

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F

Reg. No. :

Name :

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016

EC100 : BASICS OF ELECTRONICS ENGINEERING

Max. Marks : 100

Duration : 3 Hours

PART – A

Answer **all** Questions. **Each** carrying **two** marks **each**.

1. Write any four applications of electronics in the field of medical science.
2. A carbon resistor has the colour bands: green, blue, red and gold. What is its resistance value ? Also, write the colour band sequence for $390 \pm 20\% \Omega$.
3. What is the difference between active and passive components ? Name at least two in each category.
4. A Germanium diode carries a current of 1mA at room temperature when a forward bias of 0.15V is applied. Estimate the reverse saturation current at room temperature.
5. Derive the relationship between α and β of a transistor.
6. Draw the symbol and write the general specifications of the following :
 - a) Zener diode
 - b) NPN transistor.
7. What is the need for feedback in oscillators ? Explain the criteria for sustained oscillation.
8. Define ripple factor and write the values for half wave, center tapped and bridge rectifiers.
9. Draw the block diagram of a public address system.
10. Define the terms CMRR and slew rate. Give its value for an ideal op-amp.

P.T.O.

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11. Which are the universal gates ? Why are they called so ? Realize an AND gate using any one universal gate.
12. Draw the block diagram of a function generator and mark the output wave form of each block.
13. Why modulation is required in communication ?
14. Define percentage of modulation in AM and describe how the modulation index of AM wave evaluated from the waveform ?
15. Write radar range equation and specify the parameters used in the equation.
16. Why uplink frequency is different from downlink frequency in satellite communication ?
17. What is meant by frequency reuse in cellular communication ?
18. What are the major light sources used in optical fiber communication ?
19. Why FM preferred to AM for sound signal transmission in TV system ?
20. Describe the major features of HDTV system.

PART – B

Answer **any 8** Questions. **Each** carrying **five** marks **each**.

21. What is the basic working principle of transformer ? List at least four different types of transformers and its applications.
22. Draw and explain the construction of electrolytic capacitor. Write its general specifications and applications.
23. Plot the forward and reverse characteristics of a PN diode and discuss it.
24. Compare the three transistor configurations and write the applications of each.
25. Discuss the working principle of solar cell and photo diode and differentiate them.
26. With neat circuit diagram and waveforms explain the working of a bridge rectifier with capacitor filter.

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27. Discuss the need for biasing in amplifiers. Explain the functions of each component in RC coupled amplifier with relevant waveforms.
28. What is comparator ? Explain the working of an op-amp based comparator with circuit diagram and waveforms.
29. Explain the principle and working of a digital multimeter with block diagram and list the advantages over analog multimeter.
30. Draw the block diagram of a digital storage oscilloscope and specify the functions of each block.

PART – C

Answer **any 4** Questions. **Each** carrying **five** marks **each**.

31. Draw the block diagram of AM super heterodyne receiver and explain the functions of each block.
 32. Draw and explain the block diagram of pulsed radar.
 33. What are the satellite system link models ? Explain with neat diagram.
 34. What are the major network switching subsystems in GSM and explain the functions of each.
 35. With the help of block diagram, explain the working of an optical fiber communication system. What are the advantages ?
 36. Explain the operation of CCTV with block diagram and mention its applications.
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F

Reg. No. :

Name :

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016
EE100 BASICS OF ELECTRICAL ENGINEERING

Max. Marks : 100

Duration : 3 Hours

PART – A

Answer **all** questions, **each** question carries **4** marks :

1. State and explain Kirchhoff's laws.
2. What are constant voltage and constant current sources ? Voltage and current sources are mutually transferable. Explain. Derive the relationship between line and phase voltage in a star connected system.
3. Prove that in a purely inductive circuit the current lags behind the applied voltage by 90 degree and the power consumed is zero.
4. In the two wattmeter method of power measurement in a three phase circuit, the readings of the wattmeters are 4800W and – 400W. Find the total power and power factor of the load.
5. Draw and explain the typical electrical power transmission scheme.
6. Derive the e.m.f equation of a single phase transformer.
7. Explain the necessity of starter in a DC motor.
8. Compare the performance of incandescent, fluorescent, mercury vapour and metal halide lamps in terms of efficacy, colour rendering index and life.
9. Compare uniform tariff and differential tariff.
10. What are the different types of lamps available in the market ? Give the specifications of a typical lamp. What are the advantages of LED lamps ?

(10×4=40 Marks)

P.T.O.



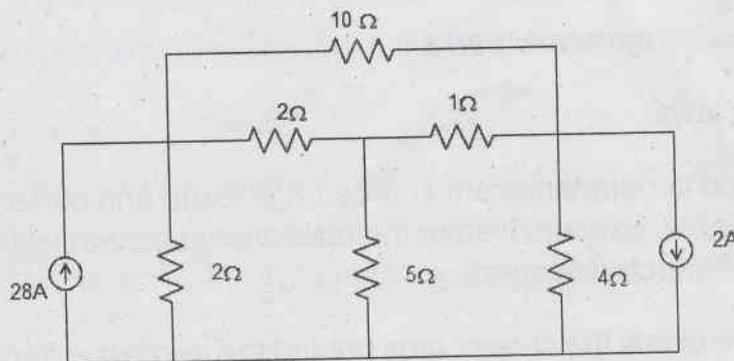
PART – B

MODULE (1 – 4)

Answer **any four** questions, **each** question carries **10** marks :

11. Use nodal analysis to form network equations and solve the nodal voltages using matrix method. Also calculate the current in different branches.

(10)



12. A steel ring of circular cross section of 1 cm in radius and having a mean circumference of 94.3 cm has an air gap of 1 mm long. It is uniformly wound with an exciting coil consisting of 600 turns and excited with a current of 2.5 A. Neglecting magnetic leakage

Calculate :

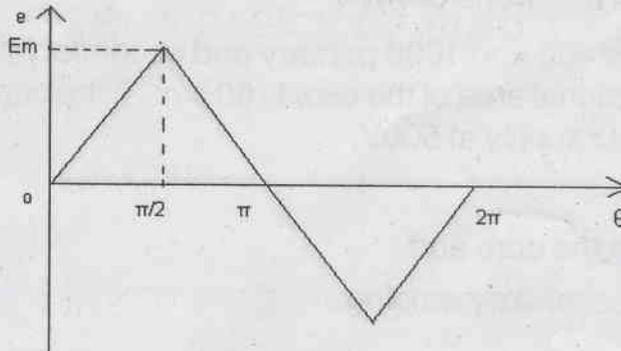
- i) m.m.f
- ii) Magnetic flux
- iii) Reluctance
- iv) Flux density
- v) Relative permeability of steel.

Assume that steel part takes about 40% of total ATs.

(10)



13. a) Define the rms value and average value of an alternating quantity. (4)
b) Find the rms value and average value of the given waveform. (6)



14. A Series R-C circuit takes a power of 7000W when connected to 200V, 50Hz supply. The voltage across the resistor is 130 V.

Calculate :

- i) Resistance
 - ii) Current
 - iii) Power factor
 - iv) Capacitance
 - v) Impedance
 - vi) Equations for instantaneous values of voltage and current. (10)
15. Explain the measurement of power in a three phase system by using two wattmeter with relevant phasor diagrams. (10)
16. With the help of block diagram explain the working of a Thermal power plant. (10)
(4×10=40 Marks)

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MODULE – 5

Answer **any one** full question :

17. a) What are the losses of single phase transformer ? (4)
- b) A single phase transformer has 400 and 1000 primary and secondary turns respectively. The net cross sectional area of the core is 60 cm^2 . If the primary winding be connected to a 50Hz supply at 500V,
Calculate :
- i) Peak value of flux density in the core and
ii) The voltage induced in the secondary winding. (6)

OR

18. a) Explain the working principle of a three phase Induction motor. (5)
- b) Calculate the generated e.m.f. in the armature winding of a 4 pole lap wound dc machine having 728 conductors running at 1800 rpm. The flux per pole is 30 mWb. (5)

MODULE – 6

Answer **any one** full question :

19. With a neat sketch explain pipe and plate earthing. (10)
- OR
20. a) With a neat sketch explain the working of a single phase ELCB. (5)
- b) Draw the schematic layout of a typical LT distribution board used in house wiring. (5)

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A

Reg. No. :

Name :

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016
MA 102 : DIFFERENTIAL EQUATIONS

Max. Marks : 100

Duration : 3 Hours

PART - A

Answer **all** questions and **each** question carries **3** marks.

1. Determine a linearly independent solution of the differential equation $(x^2 + 1) y'' - 2xy' + 2y = 0$ if $y_1 = x$ is solution.
2. Solve the differential equation $y^{IV} + 6y''' + 9y'' = 0$.
3. Find the particular integral of the differential equation $(D^2 - 2D + 1)y = xe^x$.
4. Solve by the method of variation parameters, $(D^2 + 4)y = \tan 2x$.
5. Develop the Fourier series of $f(x) = x^2$ in $-2 \leq x \leq 2$.
6. Find the Fourier sine series of $f(x) = e^x$ in $0 < x < 1$.
7. Obtain the partial differential equation by eliminating f and g from $z = xf(y) + yg(x)$.
8. Solve the partial differential equation $(y^2 + z^2)p - xyq + xz = 0$.
9. Obtain the solution of the wave equation $\frac{\partial^2 u}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}$ using method of separation of variables when the separation constant $k < 0$.
10. Write any two assumptions involved in deriving one dimensional wave equation.
11. Find the steady state temperature distribution in a rod of length 20 cm if the ends of the rod are kept at 10°C and 70°C .
12. Solve $\frac{\partial u}{\partial t} = h \frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(0, t) = u(1, t) = 0$ for $t > 0$ and $u(x, 0) = 3 \sin n\pi x$, $0 < x < 1$.

(12x3 = 36 Marks)

P.T.O.



PART – B

Answer **six** questions – **one full** question from **each** Module.

Module – 1

13. a) Reduce to first order and hence solve the ODE
i) $y'' + (y')^3 \cos y = 0$ and
ii) $2xy'' = 3y'$.
- b) Solve the IVP $y'' - 2y' + 5y = 0$, $y(0) = -3$, $y'(0) = 1$. 11
- OR
14. a) Show that the functions x and $x \ln(x)$ are linearly independent (use Wronskian). Hence form an ODE for the given basis $x, x \ln(x)$.
- b) Solve the IV $Py'' + 0.2y' + 4.01y = 0$, $y(0) = 0$, $y'(0) = 2$. 11

Module – 2

15. a) Solve the differential equation $(D + 1)^2y = x^2e^x$.
- b) Solve the differential equation $(x^3D^3 + 3x^2D^2 + xD + 1)y = x + \log x$. 11
- OR
16. a) Solve the differential equation $(D^2 + 1)y = x^2e^x + \sin x$.
- b) Solve the differential equation $(x + 1)^2y'' + (x + 1)y' - y = 2 \sin \log(x + 1)$. 11

Module – 3

17. a) Find the Fourier Series of $f(x) = \begin{cases} x & , 0 < x < 1 \\ 1-x & , 1 < x < 2 \end{cases}$.
- b) Find the Fourier cosine series of $f(x) = x(\pi - x)$ in $0 < x < \pi$. 11
- OR
18. a) Expand $f(x) = e^{-x}$ in $(-l, l)$ as a Fourier Series.
- b) Find the half range sine series of $f(x) = x \sin x$ in $0 < x < \pi$. 11

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Module – 4

19. a) Form the PDE by eliminating a, b, c from $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.

b) Solve the partial differential equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 2 \frac{\partial^2 z}{\partial y^2} = e^{2x+y}$. 11

OR

20. a) Solve : $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$.

b) Solve the partial differential equation $\frac{\partial^3 z}{\partial x^3} - 4 \frac{\partial^3 z}{\partial^2 x \partial y} + 4 \frac{\partial^3 z}{\partial x \partial y^2} = \cos(2x + y)$. 11

Module – 5

21. A tightly stretched string of length 'a' with fixed ends is initially in equilibrium position. Find the displacement $u(x, t)$ of the string if it is set vibrating by giving each of its points a velocity $v_0 \sin(\pi x/a)$. 10

OR

22. A transversely vibrating string of length 'a' is stretched between two points A and B. The initial displacement of each point of the string is zero and the initial velocity at a distance x from A is $kx(a - x)$. Find the form of the string at any subsequent time. 10

Module – 6

23. Find the temperature in a laterally insulated bar of length L whose ends are kept

at temperature zero if the initial temperature is $f(x) = \begin{cases} x & , 0 < x < L/2 \\ L - x & , L/2 < x < L \end{cases}$. 10

OR

24. An insulated rod of length L has its ends A and B maintained at 0°C and 100°C respectively until steady state conditions prevails. If B is suddenly reduced to 0°C and maintained at 0°C , then find the temperature in the rod at a distance x from A at time t. 10

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Reg. No. :

Name :

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016
ME100 : BASICS OF MECHANICAL ENGINEERING

Max. Marks : 100

Duration : 3 Hours

PART – A

Each question carries 3 marks :

1. Discuss the first law of thermodynamics applied for a process.
2. Why compression ratio of petrol engine is low compared to diesel engines ?
3. Differentiate between DBT and WBT.
4. What are the desirable characteristics of a good fuel ?
5. Why alloys are preferred over pure metallic materials in engineering applications ?
6. Discuss how thin sheets are manufactured ?
7. Mention the importance of forging.
8. List and explain any three operations performed on drilling machine.

PART – B

Answer **any two** questions from **each** Module.

Each question carries 6 marks.

Module – I

9. State and explain second law of thermodynamics. Give its application.
10. An engine operation on an air standard Otto cycle has a compression ratio equal to 7. The conditions at the start of compression are 0.1 MPa and 300 K. The pressure at the end of heat addition is 4 MPa. Determine :
 - i) thermal efficiency
 - ii) net work done where $C_v = 0.718 \text{ kJ/kg}$, $\gamma_{\text{air}} = 1.4$.
11. Sketch and explain the ideal cycle for petrol engines.

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Module – II

12. Explain with neat sketch the working of a petrol engine that produces power in a single revolution.
13. With neat sketch explain the working of centrifugal air compressor.
14. Differentiate between air motors, blowers and compressors.

Module – III

15. What are the two types of refrigeration systems ? How they differ between each other in terms of the working principle ?
16. Differentiate between summer and winter air conditioning.
17. Sketch the different processes in a psychometric chart and discuss.

Module – IV

18. Discuss the classification of IC Engines.
19. Explain about MPFI, CRDI and Hybrid engines.
20. What are the different types of drives used for power transmission in an IC engine and compare between them ?

PART – C

Answer **any 2** questions from **each** Module.

Each question carries **7** marks.

Module – V

21. Write down the procedure for developing a mould for a component.
22. Discuss any two metal joining process.
23. Name five alloys and their applications.

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Module – VI

24. Differentiate between NC and CNC machines.
25. Identify the parts of lathe shown in Figure 1 and explain the various operations that can be performed on the lathe.

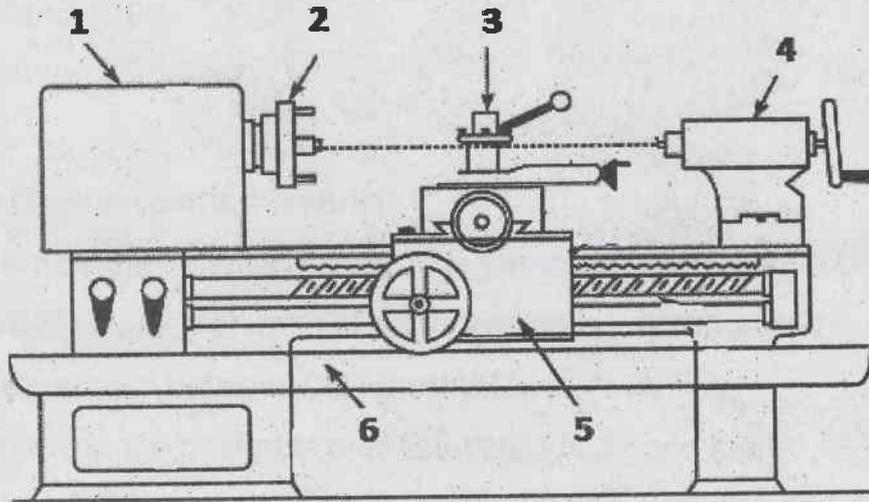


Figure 1

26. Discuss the operations which can be performed on a drilling machine.

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B

Reg. No. :

Name :

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016
PH 100 : ENGINEERING PHYSICS

Max. Marks : 100

Duration : 3 Hours

PART – A

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

1. Distinguish between free oscillation and damped oscillation.
2. State the laws of transverse vibrations of a stretched string.
3. What do you mean by optical path ?
4. What is grating element ? Write the grating equation in terms of grating element.
5. What is a Retardation plate ? Write the expression for the thickness of a QWP and HWP.
6. What is DC Josephson effect ?
7. How do you account for the natural line broadening on the basis of Heisenberg's Uncertainty principle ?
8. What do you mean by Fermi energy level and Fermi energy ?
9. Distinguish between reverberation and echo.
10. How ultrasonic waves are detected by thermal method ?
11. How population inversion is achieved in Ruby laser ?
12. Explain the principle of propagation of light through an optical fibre. (12×2=24)

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PART – B

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

13. What are the conditions for oscillations of a harmonic oscillator to be over damped, critically damped and under damped ? Compare the time – displacement curve in the three cases.
14. A piece of wire 50 cm long is stretched by a load of 2.5 kg and has a mass of 1.44 g. Find the frequency of the second harmonic.
15. Light of wave length 6000 \AA falls normally on two glass plates enclosing a wedge shaped film. The plates touch at one end and are separated at 10 cm from that end by a wire. If the bandwidth of the interference pattern is 0.05 mm, find the diameter of the wire.
16. Light of wave length 589.3 nm is incident normally on a plane transmission grating having 6000 lines/cm. Calculate the angle at which the principal maxima of the first order is formed.
17. How do you distinguish circularly polarized light from un polarized light ?
18. Write any four applications of superconductors.
19. What are the conditions to be satisfied by a wave function ?
20. What is phase space ? With the help of Heisenberg's Uncertainty relation, show that the minimum size of the unit cell in quantum statistics is hf , where h is the Planck's constant and f is the degree of freedom of the system.
21. The dimensions of an auditorium are $60 \text{ m} \times 15 \text{ m} \times 10 \text{ m}$ and its interior surfaces have an average absorption co-efficient of 0.25. Find the reverberation time of the auditorium.
22. Given that the velocity of ultrasonic waves in sea water is equal to 1440 m/s. Find the depth of a submerged submarine, if ultrasonic pulses reflected from the submarine is received 0.33 s after sending ultrasonic waves.
23. With the help of a neat diagram explain how a hologram is recorded.
24. A fibre cable has an acceptance angle of 30° and a core of refractive index 1.4. Calculate the refractive index of the cladding.

(10×4= 40)

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PART – C

Answer **any 3** questions. **Each** question carries **6** marks.

25. Write the differential equation of a forced harmonic oscillator and write its solution. Derive the expression for the amplitude and phase difference in terms of the natural frequency of the body and frequency of applied periodic force.
26. Derive the expression for the diameter of the n^{th} dark ring in Newton's ring interference pattern. With necessary equations explain briefly the experimental procedure to determine the refractive index of a liquid.
27. With the help of a neat diagram of the principal section of a nicol prism write how it produces plane polarized light and how it can be used for the analysis of plane polarized light ?
28. Compare M-B, B-E and F-D statistics. (3×6=18)

Answer **any 3** questions. **Each** question carries **6** marks.

29. What are ultrasonic waves ? Write the principle of production of ultrasonic waves by magnetostriction effect. Draw the circuit diagram of the magnetostriction oscillator. Write any two applications of ultrasonic waves.
 30. Define intensity of sound wave. Write the expression for the SIL in dB scale. Distinguish between threshold minimum intensity and threshold pain intensity.
 31. "Lasing medium with metastable state, optical resonator, and pumping mechanism are the essential requirements of a laser". How it is satisfied in He-Ne laser ?
 32. With a block diagram explain fibre optic communication system. (3×6 =18)
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