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06MAT

**First Semester B.E. Degree Examination, Dec. 07 / Jan. 08**  
**Engineering Mathematics I**

Time: 3 hrs.

Max. Marks:100

**Note :** Answer any FIVE full questions choosing at least two questions from each part.

**Part A**

- 1 a. Find the  $n^{\text{th}}$  derivatives of,
- $e^{-x} \sin^2 x$ .
  - $\frac{x}{(x-1)(2x+3)}$  (07 Marks)
- b. Prove that
- $$D^n \left[ \frac{\log x}{x} \right] = \frac{(-1)^n n!}{x^{n+1}} \left[ \log x - 1 - \frac{1}{2} - \frac{1}{3} \dots - \frac{1}{n} \right].$$
- (07 Marks)
- c. With the usual notation, prove that
- $$\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4} \left( \frac{dr}{d\theta} \right)^2.$$
- (06 Marks)
- 2 a. If  $u = \sin^{-1} \left( \frac{3x^2 + 4y^2}{3x + 4y} \right)$ , prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$ . (07 Marks)
- b. If  $u = f(x-y, y-z, z-x)$ , prove that  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$ . (07 Marks)
- c. If  $x = e^u \cos v$  and  $y = e^u \sin v$ , show that  $J \cdot J' = 1$ . (06 Marks)
- 3 a. Obtain the reduction formula for  $I_n = \int_0^{\pi/2} \cos^n x dx$ , where  $n$  is a positive integer and hence evaluate  $I_5$ . (07 Marks)
- b. Evaluate:  $\int_0^{2a} x^2 \sqrt{2ax - x^2} \cdot dx$ . (07 Marks)
- c. Trace the curve  $y^2(a-x) = x^3$ , where  $a > 0$ . (06 Marks)
- 4 a. For the cycloid  $x = a(\theta - \sin\theta)$ ,  $y = a(1 - \cos\theta)$ , find  $\frac{ds}{dx}$  and  $\frac{ds}{dy}$ . (07 Marks)
- b. Find the area of the cardioid  $r = a(1 + \cos\theta)$ . (07 Marks)
- c. By the differentiation under integral sign, evaluate  $\int_0^1 \frac{x^\alpha - 1}{\log x} dx$ , given  $\alpha \geq 0$ . (06 Marks)



## Part B

- 5 a. Solve :
- $\frac{dy}{dx} = \frac{x(2\log x + 1)}{\sin y + y \cos y}$
  - $(1 + y^2)dx = (\tan^{-1} y - x)dy$
  - $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$  (15 Marks)
- b. Find the orthogonal trajectories of the family  $\frac{2a}{r} = 1 - \cos\theta$ . (05 Marks)
- 6 a. Test for convergence of the series,
- $$\sum_{n=1}^{\infty} \frac{1}{\sqrt{n} + \sqrt{n+1}}$$
- (07 Marks)
- b. Test for convergence of the series,
- $$\frac{x}{1 \cdot 2} + \frac{x^2}{2 \cdot 3} + \frac{x^3}{3 \cdot 4} + \dots + \infty$$
- (07 Marks)
- c. Test the following series for convergence and absolute convergence,
- $$1 - \frac{1}{5} + \frac{1}{9} - \frac{1}{13} + \dots$$
- (06 Marks)
- 7 a. If  $(l_1, m_1, n_1)$  and  $(l_2, m_2, n_2)$  are the direction cosines of two lines subtending an angle  $\theta$  between them. Then prove that  $\cos\theta = l_1l_2 + m_1m_2 + n_1n_2$ . (07 Marks)
- b. Find the image of the point  $(1, -1, 2)$  in the plane  $2x + 2y + z = 1$ . (07 Marks)
- c. Find the magnitude and equations of the shortest distance between the lines  $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$  and  $\frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$ . (06 Marks)
- 8 a. A particle moves on the curve  $x = 2t^2$ ,  $y = t^2 - 4t$ ,  $z = 3t - 5$ , where  $t$  is time. Find the components of velocity and acceleration at time  $t = 1$  in the direction of  $i - 3j + 2k$ . (07 Marks)
- b. If  $\vec{F} = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$ . Then find  $\text{div}\vec{F}$  and  $\text{curl}\vec{F}$ . (07 Marks)
- c. Prove that  $\nabla \times (\phi \vec{A}) = \nabla\phi \times \vec{A} + \phi(\nabla \times \vec{A})$ . (06 Marks)

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06CHE12/22

**First/Second Semester B.E. Degree Examination, Dec. 07 / Jan. 08**  
**Engineering Chemistry**

Time: 3 hrs.

Max. Marks:100

**Note : Answer any FIVE full questions, choosing at least two questions from each part.**

**Part A**

- 1 a. Describe the Bomb calorimetric method of determination of calorific value of a solid fuel. (06 Marks)
- b. What is reforming of petroleum? Give any three reactions involved in reforming. (05 Marks)
- c. What is power alcohol? Give its advantages as a fuel. (04 Marks)
- d. What is a photo voltaic cell? Explain its working. (05 Marks)
- 2 a. What are ion selective electrodes? Explain the measurement of pH of a solution using glass electrode. (07 Marks)
- b. Explain the origin of single electrode potential. (05 Marks)
- c. Describe the construction and working of a calomel electrode. (04 Marks)
- d. Calculate the emf of the cell  $\text{Fe}/\text{Fe}^{2+}(0.01\text{M})\parallel\text{Ag}^+(0.1\text{M})/\text{Ag}$  at 298 K, if standard electrode potential of Fe and Ag electrodes are  $-0.42\text{ V}$  and  $0.8\text{ V}$  respectively. (04 Marks)
- 3 a. Explain the construction and working of lead acid battery along with the reactions involved during charging and discharging. Mention its applications. (08 Marks)
- b. Explain the construction, working and applications of Nickel – metal hydride battery. (06 Marks)
- c. Explain the construction and working of the hydrogen – oxygen fuel cell. (06 Marks)
- 4 a. Explain the differential aeration corrosion with a suitable example. (05 Marks)
- b. How does the following factors affect the rate of corrosion:
  - i) Nature of corrosion product.
  - ii) Temperature.
  - iii) PH.
 (09 Marks)
- c. Write notes on: i) Galvanizing ii) Tinning (06 Marks)

**Part B**

- 5 a. What is electroplating? Explain how the following factors influence the nature of electrodeposit: i) Metal ion concentration. ii) Wetting agents. (05 Marks)
- b. Discuss the electro plating of chromium. (05 Marks)
- c. Mention the technological importance of metal finishing. (05 Marks)
- d. Explain electroless plating of Nickel and its applications. (05 Marks)
- 6 a. Discuss the instrumentation and applications of colorimetric estimation. (08 Marks)
- b. What are liquid crystals? Explain the molecular ordering in the following liquid crystal phases: i) Nematic crystal phase ii) Chiral nematic phase iii) Smectic phase. (08 Marks)
- c. Distinguish between thermotropic and lyotropic liquid crystals with examples. (04 Marks)
- 7 a. What are polymers? Explain the free radical mechanism of addition polymerization, taking ethylene as an example. (06 Marks)
- b. What is glass transition temperature? Mention its significance. Discuss any two factors affecting glass transition temperature. (06 Marks)
- c. Explain the manufacture of the following polymers and mention their uses:
  - i) Phenol-formaldehyde
  - ii) Polymethyl methacrylate.
 (08 Marks)
- 8 a. Discuss the different types of impurities present in natural water with examples. (04 Marks)
- b. Write a note on reverse osmosis. (05 Marks)
- c. Explain the method of determining sulphate content in water by gravimetric method. (06 Marks)
- d. Calculate the COD of the effluent sample, when  $25\text{ cm}^3$  of the effluent requires  $8.3\text{ cm}^3$  of  $0.001\text{ M K}_2\text{Cr}_2\text{O}_7$  for complete oxidation. (05 Marks)

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06PHY12/22

**First/Second Semester B.E Degree Examination, Dec. 07 / Jan. 08**  
**Engineering Physics**

Time: 3 hrs.

Max. Marks:100

Note : *Answer any FIVE full questions choosing atleast TWO questions from each part.*

List the contents: i) Velocity of light  $C = 3 \times 10^8$  m/s, ii) Planck's constant  $h = 6.626 \times 10^{-34}$  J.s, iii) Boltzman constant  $K = 1.38 \times 10^{-23}$  J/K, iv) Electron mass  $m = 9.11 \times 10^{-31}$  kg. v) Electron charge  $e = 1.6 \times 10^{-19}$  C, vi) Permittivity of vacuum  $\epsilon_0 = 8.85 \times 10^{-12}$  F/m

PART - A

- 1
  - a. Explain the energy distribution in the spectrum of a block body. Give an account of the attempts made through various laws to explain the spectrum. (08 Marks)
  - b. Define phase velocity and group velocity. Derive an expression for de-Broglie wavelength from group velocity. (07 Marks)
  - c. A particle of mass  $0.65 \text{ MeV}/c^2$  has a kinetic energy 80eV. Calculate the deBroglie wavelength, group velocity and phase velocity of the deBroglie wave. (05 Marks)
- 2
  - a. Assuming the time independent Schrodinger wave equation, discuss the solution for a particle in one dimensional potential well of infinite height. Hence obtain the normalized wave function. (08 Marks)
  - b. Explain Heisenberg's uncertainty principle. Based on this, show the non-existence of electrons inside the nucleus. (07 Marks)
  - c. An electron is bond in one dimensional potential well of width 0.12nm. Find the energy values in the ground state and also the first two excited states in eV. (05 Marks)
- 3
  - a. Based on free electron theory, derive an expression for electrical conductivity of metals. How does electrical resistance change with impurity and temperature? (09 Marks)
  - b. Describe Fermi-Dirac distribution and discuss the same for different temperature conditions. (06 Marks)
  - c. The Fermi level in potassium is 2.1eV. What are the energies for which the probabilities of occupancy at 300 K are 0.99, 0.01 and 0.5? (05 Marks)
- 4
  - a. Explain the term internal field. Derive an expression for internal field in the case of one dimensional array of atoms in dielectric solids. (08 Marks)
  - b. Describe the nature of hard and soft magnetic materials. Discuss their applications. (07 Marks)
  - c. Sulphur is elemental solid dielectric whose dielectric constant is 3.4. Calculate the electronic polarisability if its density is  $2.07 \times 10^3 \text{ kg/m}^3$  and atomic weight is 32.07. (05 Marks)

PART - B

- 5
  - a. Describe the construction and working of He-Ne laser with the help of energy level diagram. (08 Marks)
  - b. Describe the recording and reconstruction processes in Holography with the help of suitable diagrams. (08 Marks)
  - c. A He-Ne laser is emitting a beam with an average power of 4.5 mW. Find the number of photons emitted per second by the laser. The wavelength of the emitted radiation is  $6328 \text{ \AA}$ . (04 Marks)
- 6
  - a. What is Superconductivity? Describe type I and type II superconductors. (08 Marks)
  - b. Explain the different types of optical fiber, along with the refractive index profile and mode propagation sketches. (07 Marks)
  - c. Calculate the numerical aperture, fractional index change and V - number for a fibre of core diameter  $40 \mu\text{m}$  and with refractive indices of 1.55 and 1.50 respectively for core and cladding. The wavelength of the propagating wave is 1400 nm. Assume that the fibre is in air. (05 Marks)
- 7
  - a. Define coordination number and packing factor. Calculate the packing factor for SC and bCC structures. (08 Marks)
  - b. Describe how Bragg's spectrometer is used for determination of crystal structure. (07 Marks)
  - c. An X-ray beam of wavelength  $0.7 \text{ \AA}$  undergoes minimum order Bragg reflection from the plane (302) of a cubic crystal at glancing angle  $35^\circ$ . Calculate the lattice constant. (05 Marks)
- 8
  - a. Describe with theory a method of measuring velocity of ultrasonic waves in a liquid and mention how the bulk modulus of the liquid could be evaluated. (08 Marks)
  - b. What are nanomaterials? Write a note on carbon nanotubes. (07 Marks)
  - c. Discuss mechanical scaling. (05 Marks)

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06CCP13/

First/Second Semester B.E. Degree Examination, Dec. 07 / Jan. 08

**Computer Concepts and 'C' Programming**

Time: 3 hrs.

Max. Marks:100

Note : Answer any FIVE full questions, choosing two questions from each part A and part B .

**PART - A**

- 1 a. Explain the functional organization of a digital computer. (10 Marks)
- b. Discuss the operation of – i) Digital pen ii) Touch screen iii) Game controller. (06 Marks)
- c. Classify the following printers into impact /non impact types – i) Dot matrix ii) Laser jet iii) Line printers iv) Daisy wheel. (04 Marks)
- 2 a. What are the differences between primary memory and secondary memory? (06 Marks)
- b. Explain briefly about address bus and data bus. (04 Marks)
- c. What are the categories of storage devices based on the technology? (10 Marks)
- 3 a. Briefly explain the classification of operating systems with examples for each. (10 Marks)
- b. What are the primary functions of operating system? (06 Marks)
- c. What are the various benefits of using a computer network? (04 Marks)
- 4 a. What are the advantages of writing algorithm? (06 Marks)
- b. Write an algorithm and flowchart to find whether a given number is prime or not. (10 Marks)
- c. What are keywords? Explain any three keywords available in 'C'. (04 Marks)

**PART - B**

- 5 a. Explain the following operators with examples. (06 Marks)
  - i) Logical operators ii) Relational operators iii) Conditional operators.
- b. What would be the value of a after the execution of the following expression. Assume the initial value of a = 5. Neatly mention the steps. (08 Marks)
  - i)  $a += (a++) + (++a)$ , ii)  $a = (--a) - (a--)$ .
- c. Give the basic structure of a C – program and write a C – program to find the largest of three given integer values. (06 Marks)
- 6 a. Write syntax of the followings – i) If – statement ii) The nested if – statement iii) The else – if ladder statement iv) Switch statement. (08 Marks)
- b. Write a C – program to generate the prime numbers in the range n1 to n2. (06 Marks)
- c. What is the difference between break and continue statement? Give the example in each. (06 Marks)
- 7 a. Explain the declaration of single dimension array and two dimension array. (04 Marks)
- b. Write a C – program to input N integer numbers into a single dimension array. Sort them in ascending order using Bubble sort technique. Print both the given array and sorted array with suitable headings. (08 Marks)
- c. Explain the categories of functions. (08 Marks)
- 8 a. Write C user defined functions (10 Marks)
  - i) To input N real numbers in to a single dimension array.
  - ii) Compute their mean
  - iii) Compute their variance
  - iv) Compute their standard deviation
 Using these functions, write a C program to input N real numbers into a single dimension array, and compute their mean, variance, and standard deviation. Output the computed results with suitable headings.
- b. Write C user defined functions : (10 Marks)
  - i) To input N integer numbers in to single dimension array.
  - ii) To sort the integer numbers in ascending order using bubble sort technique.
  - iii) To print the array elements.
 Using these functions write a C–program to input N integer numbers into a single dimension array, sort them in ascending order, and print both the given array and the sorted array with suitable headings.

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- 6 a. Define statically determinate beams. (02 Marks)  
 b. Distinguish between – i) hinged support and roller support. (04 Marks)  
 c. Determine the position of 10 N load on the beam such that the reactions at the supports are equal for the beam loaded as shown in Fig. Q 6(c).

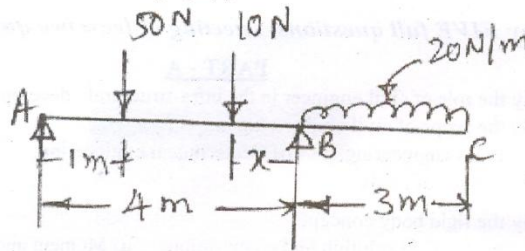


Fig. Q 6(c)

- d. Determine the reactions at the supports for the beam loaded as shown in Fig. Q 6(d). (05 Marks)

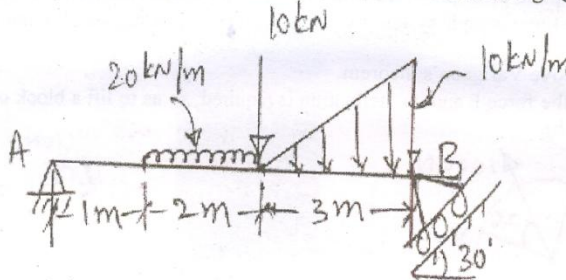


Fig. Q 6(d)

- 7 a. Define –  
 i) Angle of friction  
 ii) Cone of friction. (04 Marks)  
 b. A ladder 5 m in length is resting against a smooth vertical wall and a rough horizontal floor. The ladder makes an angle of  $60^\circ$  with the horizontal. When a man of weight 800 N is at the top of the rung, what is the coefficient of friction required at the bottom of the ladder and the floor such that the ladder does not slip? Take the weight of ladder as 200N. (08 Marks)  
 c. Determine the force P required to cause motion of blocks to impend. Take the weight of A as 90 N and weight of B as 45 N. Take the coefficient of friction for all contact surfaces as 0.25 as shown Fig. Q 7(c), consider the pulley being frictionless. (08 Marks)

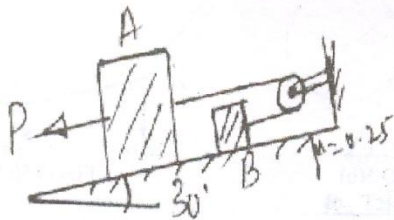


Fig. Q 7(c)

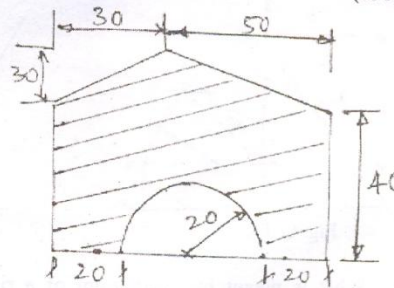


Fig. Q 8(b)

- 8 a. State and explain parallel axis theorem. (06 Marks)  
 b. Determine the second moment of the area about the horizontal centroidal axis as shown in Fig. Q 8(b). Also find radius of gyration. (14 Marks)

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06EME14/24

**First / Second Semester B.E. Degree Examination, Dec. 07 / Jan. 08**  
**Elements of Mechanical Engineering**

Time: 3 hrs.

Max. Marks:100

**Note :** 1. Answer any FIVE full questions, choosing atleast two from each PART.  
 2. Use of steam tables is permitted.

**PART A**

- 1
  - a. Describe briefly the ocean thermal energy source and its conversion. (08 Marks)
  - b. Find the internal energy of 3 kg of steam at 10 bar having a dryness fraction of 0.85. (04 Marks)
  - c. Describe the principle of operation of Babcock and Wilcox boiler with a neat sketch. (08 Marks)
- 2
  - a. Explain the principle of working of impulse and reaction turbines. (06 Marks)
  - b. Explain briefly with a neat sketch the working of Francis turbine. (08 Marks)
  - c. Explain the working principle of a gas turbine working on closed cycle. (06 Marks)
- 3
  - a. Explain the principle of operation of two-stroke petrol engine with a neat sketch. (08 Marks)
  - b. Compare a two-stroke engine with a four-stroke engine. (04 Marks)
  - c. A single cylinder, four-stroke, diesel engine develops indicated power of 30 kW at 300 rpm. The indicated mean effective pressure is 6.5 bar. The piston speed is 180 m/min. Determine the stroke and diameter of the cylinder. Also find brake specific fuel consumption, if the mechanical efficiency is 80% and indicated thermal efficiency is 30%. Take the calorific value of diesel as 40,000 kJ/kg. (08 Marks)
- 4
  - a. Define refrigeration and air conditioning. List out the desirable properties of a good refrigerant. (06 Marks)
  - b. Explain vapour compression refrigeration system with a neat sketch. (08 Marks)
  - c. Compare vapour compression and vapour absorption refrigeration systems. (06 Marks)

**PART B**

- 5
  - a. Write the specification of a lathe indicating this on a simple diagram of a lathe. (06 Marks)
  - b. List the operations that can be performed on a lathe. Explain taper turning operation by tail stock set-over method. (08 Marks)
  - c. Explain with a neat sketch, the parts of bench drilling machine. (06 Marks)
- 6
  - a. With the help of a neat sketch, explain the working of a horizontal milling machine. (08 Marks)
  - b. Explain the principle of metal removal in a cylindrical grinder with a neat sketch. (06 Marks)
  - c. With a neat sketch explain the principle of centerless grinding. (06 Marks)
- 7
  - a. Define soldering, brazing and welding. Differentiate between brazing and welding. (07 Marks)
  - b. Explain the principle of arc welding with a neat sketch. (07 Marks)
  - c. Explain Syphon Wick Lubrication System with a neat sketch. (06 Marks)
- 8
  - a. State the differences between the applications of belt and gear drives. (04 Marks)
  - b. It is required to drive a shaft A at 600 rpm by a belt using a pulley of 150 mm diameter on another parallel shaft B running at 240 rpm. What would be the diameter of the pulley on the shaft A? Find also the velocity ratio. (08 Marks)
  - c. Derive an expression to determine the length of belt in an open belt drive. (08 Marks)

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06ELN15/25

**First / Second Semester B.E. Degree Examination, Dec. 07 / Jan. 08**  
**Basic Electronics**

Time: 3 hrs.

Max. Marks:100

**Note : Answer any FIVE full questions selecting at least two questions from each part.**

**Part A**

1.
  - a. Define DC load line for a diode and explain the DC load line for circuit consisting of supply voltage in series with resistance and diode. (06 Marks)
  - b. Draw the circuit of a bridge rectifier and show that ripple factor of a bridge rectifier is 0.48. (08 Marks)
  - c. Explain how Zener diode can be used as voltage regulator. (06 Marks)
2.
  - a. Draw a sketch to show the various current components in a NPN transistor and deduce the relation between various current components. (08 Marks)
  - b. Sketch typical transistor input and output characteristics for CE configuration and briefly explain the three regions of operation. (07 Marks)
  - c. For the circuit shown in figure Q2 (c). Compute i) Three transistor currents ii) Voltage drop across  $R_C$  &  $R_B$ . (05 Marks)

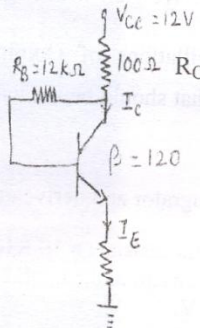


Fig. Q2 (c)

3.
  - a. Define Biasing of Transistor. Explain with neat circuit the operation of voltage divider bias circuit. (06 Marks)
  - b. Transistor is biased in voltage divider bias circuit with  $R_1 = 47K\Omega$ ,  $R_2 = 15K\Omega$ ,  $R_C = 1.5K\Omega$ ,  $R_E = 1K\Omega$ ,  $V_{CC} = 15V$ . Compute emitter voltage ( $V_E$ ), Collector voltage ( $V_C$ ) and Collector to emitter voltage ( $V_{CE}$ ). (08 Marks)
  - c. Discuss the thermal stability of transistor bias circuit with respect to  $I_{CBO}$  and  $V_{BE}$ . (06 Marks)
4.
  - a. With neat circuit diagram and waveform, explain how SCR can be triggered by application of pulse at Gate. (06 Marks)
  - b. Define the following with respect to UJT:
    - i) Interbase resistance.
    - ii) Valley point current.
    - iii) Negative resistance region. (06 Marks)
  - c. A typical JFET amplifier is shown in figure Q4 (c). Calculate the maximum and minimum output voltage produced by a  $\pm 30$  mV ac input and also calculate the circuit voltage gain in each case given forward transfer admittance ( $Y_{fs(max)} = 5000 \mu s$ ,  $Y_{fs(min)} = 1000 \mu s$ ). (08 Marks)

4 c.

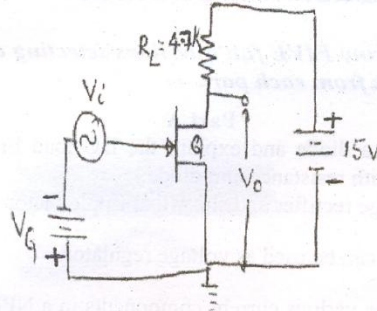


Fig. Q4 (c)

**Part B**

- 5 a. With neat circuit diagram and frequency response, explain the operation of single stage RC coupled amplifier. (06 Marks)
- b. Obtain an equation for overall voltage gain with negative feed back of negative feed back amplifier. (06 Marks)
- c. Calculate the frequency of oscillations of Colpitt's oscillator having  $C_1 = 2000 \text{ pF}$ ,  $C_2 = 1000 \text{ pF}$  and  $L = 4 \text{ mH}$ . What should be the value of L if the frequency of oscillation is 140 KHz. (08 Marks)
- 6 a. Draw the circuit of op-amp as integrator and derive an expression for output voltage. (06 Marks)
- b. A non inverting amplifier has input resistance  $10 \text{ K}\Omega$  and feed back resistance  $60 \text{ K}\Omega$  with load resistance  $47 \text{ K}\Omega$ . Draw the circuit and calculate output voltage, voltage gain and load current when input voltage is 1.5 V. (08 Marks)
- c. List the ideal characteristics of an op-amp. (06 Marks)
- 7 a. Draw the block diagram of a super heterodyne AM receiver and explain the functions of each block. (10 Marks)
- b. A carrier of 750 W, 1 MHz is amplitude modulated by sinusoidal signal of 2 KHz to a depth of 50% calculate Band width Power in side band and total power transmitted. (06 Marks)
- c. Convert the following hexadecimal number into decimal. (04 Marks)
- A3BH
  - 2F3H
- 8 a. Realize the following expression using Basic gates: (06 Marks)
- $Y = \overline{BC} + \overline{AC} + \overline{AB}$ .
  - $Y = \overline{AB} + \overline{AB}$
  - $Y = \overline{AB} + A + (\overline{B+C})$
- b. Simplify the following Boolean Expressions (06 Marks)
- $AB + \overline{AC} + \overline{ABC}(AB+C)$ .
  - $\overline{\overline{AB} + \overline{ABC} + A(B+\overline{AB})}$
- c. Realize Full adder circuit using NAND gate and write its truth table. (08 Marks)

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06ELE15/25

**First / Second Semester B.E. Degree Examination, Dec. 07 / Jan. 08**  
**Basic Electrical Engineering**

Time: 3 hrs.

Max. Marks:100

**Note : Answer any FIVE full questions selecting  
atleast TWO questions from each PART.**

**PART A**

- 1
  - a. Explain Ohm's law and state its limitations. (05 Marks)
  - b. Define coefficient of coupling and establish a relation between self-inductance, mutual inductance with the coefficient of coupling. (07 Marks)
  - c. A current of 20 A flows through two ammeters A and B in series. The potential difference across A is 0.2 V and across B is 0.3 V. Find how the same current will divide between A and B when they are in parallel. (08 Marks)
  
- 2
  - a. Sketch the sinusoidal alternating current wave form and denote as well as define the following terms:
    - i) Instantaneous value
    - ii) Peak to peak value
    - iii) Peak amplitude. (05 Marks)
  - b. A series RLC circuit is composed of 100 ohms resistance, 1.0 H inductance and 5  $\mu$ F capacitance. A voltage,  $V(t) = 141.4\cos 377t$  volts is applied to the circuit. Determine the current and voltages  $V_R$ ,  $V_L$  and  $V_C$ . (07 Marks)
  - c. An impedance coil in parallel with a 100  $\mu$ F capacitor is connected across a 200 V, 50 Hz supply. The coil takes a current of 4 A and the power loss in the coil is 600 W. Calculate:
    - i) The resistance of the coil
    - ii) The inductance of the coil
    - iii) The power factor of the entire circuit. (08 Marks)
  
- 3
  - a. What is the necessity and advantages of three phase systems? (05 Marks)
  - b. Show that two wattmeters are sufficient to measure power in 3-phase balanced star connected circuits with the aid of neat circuit diagram and phasor diagrams. (08 Marks)
  - c. A three phase load of three equal impedances connected in delta across a balanced 400 V supply takes a line current of 10 A at a power factor of 0.7 lagging. Calculate from the first principles:
    - i) The phase current
    - ii) The total power
    - iii) The total reactive KVA.
 If the windings are connected in star, what will be the new value of phase current and the total power? (07 Marks)
  
- 4
  - a. Describe the factors affecting the choice of a wiring system. (05 Marks)
  - b. With a neat connection diagram and switching table explain the TWO POINT CONTROL of a lamp. (07 Marks)
  - c. Explain construction and principle of operation of dynamometer type wattmeter with a neat sketch. (08 Marks)

## PART B

- 5 a. Explain the working principle of a DC machine as a generator and motor with suitable diagrams. (06 Marks)
- b. Sketch N-I and T-I characteristics of DC i) Series and ii) Shunt motors. Mention two applications of each motor. (06 Marks)
- c. A series motor runs at 600 rpm when taking 110 A from a 250 V supply. The resistance of the armature circuit is  $0.12 \Omega$ , and that of series winding is  $0.03 \Omega$ . The useful flux per pole for 120 A is 0.024 Wb, and that for 50 A is 0.0155 Wb. Calculate the speed when the current has fallen to 50 A. (08 Marks)
- 6 a. Derive an expression for the electromotive force induced in the secondary winding of a transformer. (05 Marks)
- b. What are the losses in a transformer? On what factors do they depend? How they are minimized? (06 Marks)
- c. A single phase 25 kVA 1000/2000 V, 50 Hz transformer has maximum efficiency of 98% at full load upf. Determine its efficiency at:
- $\frac{3}{4}$  full load upf
  - $\frac{1}{2}$  full load 0.8 pF
  - 1.25 full load 0.9 pF.
- (09 Marks)
- 7 a. Enumerate the advantages of having stationary armature and rotating field system in large capacity synchronous generators. (06 Marks)
- b. Explain the terms pitch factor, distribution factor and winding factor as applied to an alternator. (06 Marks)
- c. A three phase, star connected synchronous generator driven at 900 r/min is required to generate a line voltage of 460 V at 60 Hz on open circuit. The stator has two slots per pole per phase, and 4 conductors per slot. Calculate:
- The number of poles
  - The useful flux per pole.
- (08 Marks)
- 8 a. With neat sketches explain the constructional details of squirrel cage and phase wound induction motors. (08 Marks)
- b. Explain the significance of 'slip' in induction motors. (06 Marks)
- c. If a six pole induction motor supplied from a three phase 50 Hz supply has a rotor frequency of 2.3 Hz. Calculate:
- The percentage slip
  - The speed of the motor.
- (06 Marks)

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Question Paper Version : D

**I / II Semester B.E Degree Examination, Dec. 07 / Jan. 08**  
**CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS**  
**(COMMON TO ALL BRANCHES)**

Time: 2 hrs.]

[Max. Marks: 50

***INSTRUCTIONS TO THE CANDIDATES***

1. Use only **Black ball point pen** for writing / darkening the circles.
2. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
3. Darkening two circles for the same question makes the answer invalid.
4. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. Affirmation of the office by the President of India is in front of the
    - a) The Prime minister
    - b) Vice – President
    - c) Chief Justice
    - d) Chief Election Commissioner
  2. Military powers of the President are described in
    - a) Article 356
    - b) Article 74
    - c) Article 53(2)
    - d) Article 58
  3. The Vice - President of India holds the ----- rank according to the Indian constitution
    - a) 1<sup>st</sup>
    - b) 2<sup>nd</sup>
    - c) 3<sup>rd</sup>
    - d) 4<sup>th</sup>
  4. The 11 member Constitutional Review Committee set up in the year 2000 to review the Indian Constitution was chaired by
    - a) Justice M.N. Vekatachalaiah
    - b) Sri Ramakrishna Hegde
    - c) Sri M.V. Pylee
    - d) Dr. A.P.J. Abdul Kalam
  5. The total strength of the members of the Raj- Sabha is
    - a) 241
    - b) 242
    - c) 243
    - d) 244
  6. According to Article ----- no child below the age of ----- years shall be employed to work in any factory or mine or engaged in any other hazardous employment.
    - a) Article 24 Age 12 years
    - b) Article 24 Age 14 years
    - c) Article 42 Age 12 years
    - d) Article 42 Age 14 years
  7. Which Article of the constitution provides for special consideration with regard to the appointment in certain services for the Anglo – Indian community
    - a) Article 336
    - b) Article 337
    - c) Article 338
    - d) Article 339
  8. The rank of the Speaker of the Lok-Sabha is 6<sup>th</sup>. This is equal to that of the
    - a) Vice – President of India
    - b) The Chief Justice of the High- Court
    - c) The Chief- Minister of state
    - d) The Chief Justice of the Supreme-Court.

9. The seat of a member of Parliament may be declared vacant, if he is , without the permission of the house absent for the meeting of that house for a period of  
a) 40 days            b) 60 days            c) 90 days            d) 25 days
10. The codes of ethics can be taken as guidelines by engineers to  
a) Formulate the problems            b) resolve the conflicts  
c) Overcome the work pressure            d) shift the responsibility
11. Intentionally conveying false or misleading information is  
a) Lying            b) Deception            c) Falsehood            d) Both (a) and (c).
12. Smoothing of irregularities to make the data to appear accurate and precise is  
a) Cooking            b) Trimming            c) Skimming            d) Scanning
13. Which of the following does not depict the attitude towards the responsibility  
a) Minimalist            b) Reasonable care            c) Protest            d) Good works
14. The tendency of shifting the responsibility will logically come down if there is  
a) Group thinking            b) Microscopic vision            c) Fear            d) Confusion
15. A compound measure of the probability and magnitude of adverse effect is known as  
a) Benefit            b) Compensation            c) Risk            d) liability
16. Which of the following is not advised by NSPE (National society for professional Engineers) code to engineers?  
a) To be honest            b) To have professional obligations  
c) Not to use firm name in dishonest business            d) not to avoid deceptive acts.
17. ----- is not a trade secret.  
a) Formulae            b) Generated pattern            c) Equipment            d) Theorems
18. The formula of a soft drink is an example of  
a) Trade secret            b) Trade mark            c) Patent            d) Copyright
19. Protecting the expressions of the ideas but not the idea itself is  
a) Copyright            b) Patent            c) Plagiarism            d) Trademark
20. The patent holder does not allow others to use the patented information for ----- years from the date of filing  
a) 20            b) 25            c) 15            d) 50
21. Indian constitution is flexible. This means it  
a) Can be amended easily            b) Does not allow frequent changes  
c) Cannot be amended easily  
d) Can be amended only after undergoing a special procedure in Parliament.
22. Our constitution declares India as republic. This means  
a) It is union of states            b) Its highest legislature is directly elected by the people  
c) Its head of the state is elected for a fixed period            d) It is sovereign in all respects.
23. The work of framing the constitution of India started in December 1946 and completed in  
a) November 1949            b) January 1949            c) January 1950            d) December 1948
24. Magna Carta is a written document of 13<sup>th</sup> century assuring liberties awarded to  
a) Indian citizens            b) French citizens            c) British citizens  
d) Citizens of the world by UNO

25. Out of the articles on fundamental rights, the most liked articles by Dr B. R. Ambedkar in Part III of the Indian constitution are  
 a) 23 & 24                      b) 25 to 28                      c) 29 to 30                      d) 32 & 32 A
26. Part III articles 23 & 24 deals with  
 a) Right against exploitation                      b) Right to freedom of religion  
 c) Right to constitutional remedies                      d) Cultural and educational rights of citizens
27. According to Indian constitution, the powers of amending the constitution are vested with  
 a) The president of India                      b) The people of India  
 c) The Prime minister of India                      d) The parliament of India
28. The 44<sup>th</sup> Constitutional amendment was made during  
 a) Congress party rule in 1974                      b) Janatha party rule in 1978  
 c) Congress party rule in 1985                      d) B J P rule in 2000
29. Habeas Corpus writ means  
 a) An order to officials to perform duties  
 b) An order issued to stop exercise of excess jurisdiction  
 c) An order which enables shifting of a case to a higher court  
 d) An order issued against illegal detention
30. By the recommendations of the committee under the chairmanship of S. Swaran Singh the fundamental duties of Indian citizens are included in the constitution through  
 a) 40<sup>th</sup> amendment                      b) 41<sup>st</sup> amendment  
 c) 42<sup>nd</sup> amendment                      d) 44<sup>th</sup> amendment
31. Which one of the following is not a fundamental duty?  
 a) To safeguard public property                      b) To render national service  
 c) To uphold national sovereignty of the country                      d) To honor inter cast marriages
32. The Republic day celebrations in India signifies  
 a) Indian independence.  
 b) The declaration of Purna Swaraj by Indian national congress  
 c) The constitution being officially introduced in India  
 d) The fundamental rights awarded to Indian citizens.
33. India is secular. That means  
 a) India is anti-religion                      b) India views all religions equally  
 c) India does not believe in the religion                      d) India promotes origin of new religions
34. Bicameral legislature means  
 a) Two party (ruling & opposition) government  
 b) Upper & lower house in the Parliament.  
 c) The president & prime minister leading the government  
 d) The central legislature & state legislature running the government.
35. Socialism means  
 a) Encouraging socio economic imbalances                      b) Promotion of inter cast marriages  
 c) Eradication of socio economic imbalances                      d) Discouraging inter cast marriages.

36. According to the 97<sup>th</sup> amendment of 2003, the total strength of the council of ministers should not exceed ----- of the total strength of Lok Sabha  
 a) 10 %                      b) 15 %                      c) 20 %                      d) 13 %
37. Who of the following administers the oath of office and secrecy to the Chief minister and his ministry in a state?  
 a) The Chief Justice of the High court                      b) The senior Judge of the High court  
 c) The Governor of the state                      d) The President of India
38. The term of office of the Chief Election Commissioner of India is  
 a) Six years or until the age of 62 years                      b) Five years or until the age 65 years  
 c) Five years or until the age of 62 years                      d) Six years or until the age of 65 years.
39. The Raja Sabha from amongst its own members elects its  
 a) Speaker                      b) Deputy chairman                      c) Chairman                      d) Deputy Speaker.
40. The President of India may address his resignation to the  
 a) Prime minister                      b) Speaker                      c) Vice President                      d) Chief Justice of India.
41. The oath of office and secrecy to the Governor of the state is administered by the  
 a) The Chief Justice of the High court                      b) The President of India  
 c) Chief Justice of India                      d) Chief Minister of the state.
42. The minimum age prescribed for the membership of Rajya Sabha is  
 a) 21 years                      b) 25 years                      c) 35 years                      d) 30 years.
43. 1/3<sup>rd</sup> of the members of the Raja Sabha retire every  
 a) 5 years                      b) 2 years                      c) 3 years                      d) 4 years.
44. According to the Marriage Act 1954, the age fixed for marriage for men is 21 years and for women is.  
 a) 16 years                      b) 18 years                      c) 21 years                      d) 19 years.
45. How many times the President can return a bill for reconsideration by the Parliament?  
 a) Twice                      b) Thrice                      c) Once                      d) Any number of times.
46. According to Article 356, State Emergency or Emergency due to the failure of constitutional machinery in a state is known as  
 a) Governor's rule                      b) Speaker's rule                      c) Prime minister's rule                      d) President's rule.
47. Governor of a State is responsible to the  
 a) President                      b) Prime minister                      c) Chief minister                      d) Vice – President.
48. Who can issue Ordinances?  
 a) The Minister of Cabinet rank                      b) The Prime Minister  
 c) The President                      d) The Speaker of the Lok Sabha.
49. The Indian Constitution is called 'Quasi –Federal' because it has  
 a) Single citizenship                      b) Single Judiciary  
 c) Emergency powers                      d) Republican features
50. In which five year plan, we are now in 2002- 2007?  
 a) 8<sup>th</sup>                      b) 9<sup>th</sup>                      c) 10<sup>th</sup>                      d) 11<sup>th</sup>



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Question Paper Version : D

**I / II Semester B.E Degree Examination, Dec. 07 / Jan. 08**  
**ENVIRONMENTAL STUDIES**  
**(COMMON TO ALL BRANCHES)**

Time: 2 hrs.]

[Max. Marks: 50

**INSTRUCTIONS TO THE CANDIDATES**

1. Use only **Black ball point pen** for writing / darkening the circles.
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1. Noise pollution limit in the industrial area is  
a) 45 dB      b) 80 dB      c) 65 dB      d) 90 dB
2. Which of the following is not a solution for global warming?  
a) Reducing fossil fuel consumption      b) Planting more trees  
c) Deforestation      d) None of the above
3. The 4-stroke engines produce less of the following compared to 2-stroke engines  
a) CO and hydrocarbons      b) NO<sub>x</sub> and SO<sub>2</sub>  
c) Both a and b      d) None of the above
4. Which of the following is not the effect of urbanization?  
a) Air pollution      b) Thermal pollution      c) Solid waste production      d) Noise pollution
5. The average life expectancy around the world is currently  
a) Decreasing      b) Increasing      c) Not changing      d) Stabilizing
6. Global warming may bring about the following change in the climate of the Earth  
a) Increase in the rainfall      b) Desertification      c) Draught      d) All of the above
7. The pH value of the acid rain water is  
a) 5.7      b) 7.0      c) 8.5      d) 7.5
8. Acid rain can be controlled by  
a) Reducing SO<sub>2</sub> and NO<sub>2</sub> emissions      b) Reducing oxygen emissions  
c) Increasing the number of lakes      d) Increasing the forest cover

9. Which of the following statements about ozone is true?  
a) Ozone is a major constituent of photochemical smog  
b) Ozone protects us from the harmful UV radiation of the sun  
c) Ozone is highly reactive d) All of the above
10. Ozone layers absorb  
a) UV rays b) Infra red rays c) Cosmic rays d) CO
11. Each chlorine free radical can destroy the following number of ozone molecules  
a) 1000 b) 10000 c) 100000 d) 100
12. Which of the following statements is not true about animal husbandry?  
a) It is a part of agricultural activity  
b) It is breeding, feeding and management of animals  
c) It is livestock production d) It is protection of wild life
13. Domesticated animals are used for  
a) Dairy products b) Production of fiber c) Production of meat d) All of above
14. Animal husbandry results in  
a) Global Warming b) Acid rains c) Ozone depletion d) None of the above
15. The Water (Prevention & Control of Pollution) Act was enacted in the year  
a) 1986 b) 1974 c) 1994 d) 2004
16. The first of the major environmental protection act promulgated in India was :  
a) The wild life protection act b) The air act  
c) The noise pollution act d) None of the above
17. The leader of the Chipko movement is  
a) Sunderlal Bahuguna b) Medha Patkar c) Vandana Shiva d) Suresh Heblkar
18. The Tiger Conservation Project was started in :  
a) 1973 b) 1984 c) 1999 d) 2004
19. Which state is having the highest women literacy rate in India?  
a) Karnataka b) Punjab c) Rajasthan d) Kerala
20. Environmental Protection is the fundamental duty of the citizen of India under the Article:  
a) 51-A (g) b) 48-A c) 47 d) 21
21. Which of the following is a biotic component of an ecosystem?  
a) Fungi b) Solar light c) Temperature d) Humidity
22. Which of the following statement is false?  
a) Inorganic nutrients are recycled in an eco-system  
b) Energy flows through the eco-system in the form of carbon-carbon bonds  
c) Energy is recycled in an eco-system  
d) Respiration process releases energy
23. The basic requirement of human beings are provided by  
a) Industrialization b) Agriculture c) Nature d) Urbanization

24. World Environment Day is on  
a) 5<sup>th</sup> May      b) 5<sup>th</sup> June      c) 18<sup>th</sup> July      d) 16<sup>th</sup> August
25. Socio-Economic security in environmental aspects involves  
a) Fairness and equity in distribution costs for complete existing generation  
b) Welfare of the present generation  
c) Intra and inter generational equity of resources  
d) All of the above
26. Which of the following conditions must be fulfilled to ensure food security?  
a) Food must be available  
b) Each person must have access to it  
c) Food utilized/consumed must fulfill nutritional requirement  
d) All of the above
27. The most important remedy to avoid negative impact due to industrialization is  
a) Industries must be closed      b) New industries should not be started  
c) Industries must treat all the wastes generated by them  
d) Industries must be shifted far away from the human habitats
28. E.I.A. is related to  
a) Resource conservation      b) Efficient equipment/process  
c) Waste minimization      d) All of the above
29. Which of the following is a key element of E I A?  
a) Scoping      b) Screening  
c) Identifying and evaluating alternatives      d) All of the above
30. Eutrophication is  
a) An improved quality of water in lakes  
b) A process in carbon cycle  
c) The result of accumulation of plant nutrients in water bodies  
d) A water purification technique
31. Which of the following is the most environmental friendly agriculture practice?  
a) Using chemical fertilizers      b) Using insecticides  
c) Organic farming      d) None of the above
32. Farmers have a tendency to  
a) Use optimum quantity of water      b) To over irrigate their crops  
c) To conserve water      d) All of the above
33. Environmental impact of mining  
a) Brings order into social setup      b) is devastation of ecosystem  
c) Present mining activity is a sustainable development  
d) Mining has no adverse effect on ecosystem as it is in remote areas
34. Which of the following statement about forests is not correct?  
a) Forests reduce erosion  
b) Forests provide recreational opportunities  
c) Forests provide a source of economic development  
d) None of the above

35. Fixation of nitrogen is done by  
a) Lightning b) Fixing bacteria c) Fertilizer factory d) All of above
36. What is the maximum allowable concentration of fluorides in drinking water?  
a) 1.0 mg/l b) 1.25 mg/l c) 1.5 mg/l d) 1.75 mg/l
37. Conversion of ammonium to  $\text{NO}_3$  by chemical oxidation is termed as  
a) Mineralization b) Leaching c) Nitrification d) Denitrification
38. Conversion of nitrates into gases of nitrogen is called  
a) Nitrification b) Nitrogen fixing c) Reduction d) Denitrification
39. Among the fresh water available on the Earth, the percentage of surface water is about  
a) 50% b) 10% c) 5% d) Less than 1%
40. Excessive nitrate in drinking water causes  
a) Fever b) Cough and chill c) Blue babies d) Gastro enteritis
41. Which of the following is not a part of the hydrological cycle?  
a) Precipitation b) Infiltration c) Transpiration d) Perspiration
42. Which of the following is considered as an alternate fuel?  
a) CNG b) Kerosene c) Coal d) Petrol
43. Harnessing wind energy is done by  
a) Wind mill b) Ball mill c) Flour mill d) Pug mill
44. With a minimum resource, maximum energy can be created by  
a) Solar radiation b) Wind c) Nuclear fuels d) Tidal waves
45. Fossil fuels are converted into energy by  
a) Burning b) Cooling c) Sublimation d) Melting
46. Mining practices lead to  
a) Population growth b) Rapid urbanization  
c) Loss of grazing and fertile land d) None of these
47. The liquid waste from bath and kitchens is called  
a) Sullage b) Domestic sewage c) Storm waste d) Run off
48. Physical pollution of water is due to  
a) Dissolved oxygen b) Turbidity c) pH d) None of these
49. Which of the following is non point source of water pollution?  
a) Factories b) Sewage treatment plant  
c) Urban and sub-urban land d) All of the above
50. Which of the following statements about carbon monoxide is true?  
a) Forms complex with hemoglobin b) Forms complex with leg-hemoglobin  
c) Formed by the incomplete combustion of fossil fuels d) Both a and c

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06MAT21

**Second Semester B.E. Degree Examination, Dec. 07 / Jan. 08**  
**Engineering Mathematics – II**

Time: 3 hrs.

Max. Marks:100

**Note : Answer any FIVE questions choosing atleast TWO questions from each part.**

**PART – A**

- 1
- a. For the curve  $y = \frac{ax}{a+x}$ , show that  $\left(\frac{2\rho}{a}\right)^{2/3} = \left(\frac{x}{y}\right)^2 + \left(\frac{y}{x}\right)^2$ . (06 Marks)
- b. State and prove Cauchy's mean value theorem. (07 Marks)
- c. Expand  $e^{\sin x}$  by Maclaurin's series upto the term containing  $x^4$ . (07 Marks)
- 2
- a. Evaluate
- i)  $\lim_{x \rightarrow 0} \frac{a^x - b^x}{x}$
- ii)  $\lim_{x \rightarrow \infty} \left( \frac{1^{\frac{1}{x}} + 2^{\frac{1}{x}} + 3^{\frac{1}{x}}}{3} \right)^{3x}$  (06 Marks)
- b. Expand  $\tan^{-1}\left(\frac{y}{x}\right)$  about the point (1, 1) up to 2<sup>nd</sup> degree terms using Taylor's series. (07 Marks)
- c. Find the minimum value of  $x^2 + y^2 + z^2$  when  $x + y + z = 3a$ . (07 Marks)
- 3
- a. Evaluate the integral  $\int_0^a \int_0^a \frac{x}{x^2 + y^2} dx dy$  by changing the order of integration. (06 Marks)
- b. Evaluate the integral  $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^0 \frac{dz dy dx}{\sqrt{x^2 + y^2} \sqrt{x^2 + y^2 + z^2}}$ . (07 Marks)
- c. Show that  $\int_0^1 (m, n) = \int_0^1 \frac{(x^{m-1} + x^{n-1})}{(1+x)^{m+n}} dx$ . (07 Marks)
- 4
- a. Using Green's theorem in the plane evaluate  $\int_C [(2x^2 - y^2)dx + (x^2 + y^2)dy]$  where C is the boundary of the region bounded by  $x = 0, y = 0, x + y = 1$ . (06 Marks)
- b. Using Divergence theorem evaluate  $\int_s \vec{F} \cdot \vec{n} ds$  where  $\vec{F} = (2x + 3z)\hat{i} - (xz + y)\hat{j} + (y^2 + 2z)\hat{k}$  and s is the surface of the sphere having center at (3, -1, 2) and radius 3. (07 Marks)
- c. Prove that spherical polar coordinate system is orthogonal. (07 Marks)

**PART - B**

- 5 a. Solve:  $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$  (06 Marks)
- b. Solve:  $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$ . (07 Marks)
- c. Using the method of undetermined coefficients solve  $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 4y = 2x^2 + 3e^{-x}$ . (07 Marks)
- 6 a. Solve:  $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = \frac{1}{1-e^x}$  by using the method of variation of parameters. (06 Marks)
- b. Solve:  $(2x+3)^2 \frac{d^2y}{dx^2} + 5(2x+3)\frac{dy}{dx} + y = 4x$ . (07 Marks)
- c. Solve:  $\frac{d^2x}{dt^2} - 4\frac{dx}{dt} + 13x = 0$  with  $x(0) = 0$ ,  $\frac{dx(0)}{dt} = 2$ . (07 Marks)
- 7 a. Evaluate :
- i)  $L\{te^{-2t} \sin 4t\}$       ii)  $L\left\{\frac{1-\cos at}{t}\right\}$  (06 Marks)
- b. Define periodic function. If  $f(t)$  is a periodic function with period  $T$  then show that
- $$L\{f(t)\} = \frac{1}{1-e^{-sT}} \int_0^T e^{-st} f(t) dt$$
- (07 Marks)
- c. Express  $f(t) = \begin{cases} 1 & \text{if } 0 < t \leq 1 \\ t & \text{if } 1 < t \leq 2 \\ t^2 & \text{if } t > 2 \end{cases}$  in terms of unit step function and hence find  $L\{f(t)\}$ . (07 Marks)
- 8 a. Find :
- i)  $L^{-1}\left\{\frac{s+2}{s^2-4s+13}\right\}$       ii)  $L^{-1}\left\{\log \frac{s^2+1}{s(s+1)}\right\}$  (06 Marks)
- b. Find the inverse Laplace transform of  $\frac{s}{(s^2+1)(s^2+4)}$  using convolution theorem. (07 Marks)
- c. Solve the differential equation
- $$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^{2x}, \quad y(0) = 2, \quad y'(0) = -1$$
- by using Laplace transforms. (07 Marks)

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