

B. Tech.
SEMESTER -Ist
MAJOR EXAMINATION 2018 - 2019
Subject Name: Engineering Physics-I

Max. Marks: 50

Time: 3 Hrs.

Note: Attempt all questions. Each question carry equal marks.

(5 × 2 = 10)

1. Attempt any five parts of the following:

- (a) What do you mean by frame of reference? What are the differences between inertial and non-inertial frame of reference?
- (b) Derive the relativistic velocity addition theorem. Show that no material particle can travel faster than the velocity of light.
- (c) The mass of a moving electron is 11 times its rest mass. Find the kinetic energy and momentum.
- (d) Establish Einstein's mass-energy relation. Give two physical examples of Einstein's mass-energy equivalence.
- (e) Compare the wavelength of a photon and electron having (i) Same momentum (ii) Same energy.
- (f) What was the objective of Davisson-Germer experiment? Discuss the results of this experiment.
- (g) State Heisenberg uncertainty principle. If the uncertainty in the location of a particle is equal to its de Broglie wavelength, then find out the uncertainty in its velocity.

(2 × 5 = 10)

2. Attempt any two parts of the following:

- (a) Why the Newton's Rings are circular? Derive expression for the diameter of bright ring.
- (b) A diffraction grating used at normal incidence gives a line $\lambda_1 = 6000 \text{ \AA}$ in a certain order superimposed on another line $\lambda_2 = 4500 \text{ \AA}$ of the next higher order. If the angle of diffraction is 30° , calculate the number of lines in 1 cm of the grating.
- (c) Write the condition of secondary maxima for a single slit and show that the intensities of the successive maxima are in the ratio
1: 1/22: 1/61: 1/121:

(2 × 5 = 10)

3. Attempt any two parts of the following:

- (a) In Newton's ring experiment, the diameter of 4th and 12th dark rings is 0.4 and 0.7 cm, respectively. Find the diameter of 20th dark ring.
- (b) The indices of refraction of quartz for right handed and left handed circularly polarized light of wavelength 7620 \AA are 1.53914 and 1.53920 respectively. Calculate the rotation of the plane of polarization of the light in degrees produced by a plate 0.5 mm thick.
- (c) Discuss the production and detection of plane, elliptically, and circularly polarised light?

(2 × 5 = 10)

4. Attempt any two parts of the following:

- (a) Mention the essential conditions for lasing action. With the help of suitable diagram, explain the principle, construction and working of Ruby laser.
- (b) What is holography? Explain recording and reconstruction of a hologram. List some important applications of holography.
- (c) An optical fibre has NA of 0.20 and a cladding refractive index of 1.59. Determine the acceptance angle for the fibre in water, which has refractive index of 1.33.

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B.Tech.

ODD SEMESTER

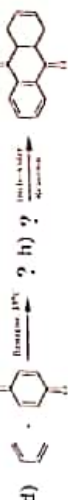
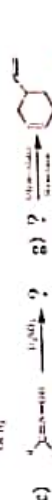
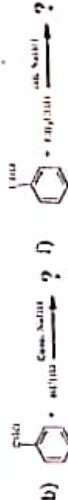
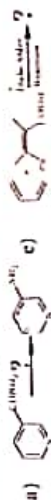
Major Examination 2018-2019

Subject Name: Engineering Chemistry

Time: 3 hrs. Max. Marks: 50 Note: Attempt all questions. All questions carry equal marks.

Q.1 Attempt any five of the following.

- Write down a brief note on fullerene- C_{60} and its applications. 2
- Draw MO energy level diagram for the F_2 molecule. What is the order of stability among F_2^+ , F_2 and F_2^- ? 2
- What is meant by bonding and anti-bonding molecular orbitals? What are the conditions of linear combination of atomic orbitals (LCAO)? 2
- Discuss the different conformations of butane. How will you account for the difference in their relative stability? 2
- What are various types of organic reactions? Explain them with one suitable example each. 2
- Complete the following reactions. 2



Q.2 What is Beckmann and Hofmann rearrangement? Discuss the mechanism of the reaction. 2

Q.3 Attempt any two of the following.

- How is natural rubber obtained from latex? 5
 - Classification of conducting polymers with examples. 5
 - How do you prepare the following polymers and vulcanized rubbers? i) Bakelite, ii) PAN iii) Glyptal iv) Polylactic acid and v) Vulcanization of poly butadiene by sulphur and mercaptoacid 5
 - Starting from cyclohexane and styrene, how can nylon-6 and polystyrene be prepared? 5
- A 0.80 g sample of a solid fuel was completely combusted in the excess of oxygen using bomb calorimeter. The rise in temperature of water in calorimeter was $2.5^\circ C$. Calculate the high and low calorific value of the fuel, if water taken in calorimeter is 2000 g and water equivalent of calorimeter is 2200 g. Give answer in kJ/kg.
- Q.3 Attempt any two of the following.
- Write notes on: 5
 - Mechanism of cationic polymerization
 - Mechanism of free radical polymerization

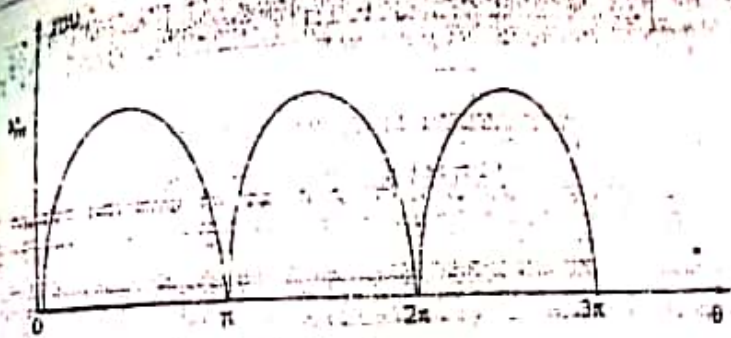


Figure. 4

- (b) If the terminal voltage of the circuit is $100 \sin \omega t + 50 \sin (3\omega t + \pi/4)$ and the current flowing is $10 \sin (\omega t + \pi/3) + 5 \sin 3\omega t$, calculate the total power consumption in the circuit and over all power factor.
- (c) What is requirement of earthing. Explain with a relevant circuit diagram, how earthing protects humans from an electric shock at residential premises. Why earthing wires are comparatively thicker.

(2 × 5 = 10)

4.

Attempt any two parts of the following:

- (a) What is three phase ac system? Explain three phase delta connection with suitable phasor diagram and derive the expression of power for this connection at lagging power factor.
- (b) A three phase, three wire, star connected system has 150 V between phase to phase. Each phase has $Z = 5 \angle -30^\circ$. Find; (i) current in each phase, (ii) total power, draw phasor diagram.
- (c) A balanced three phase, star connected load of 180 kW is taking a leading current of 300 A when connected across a three phase, 440 V, 50 Hz supply. Find the values and nature of the load current and also power factor of the load

(2 × 5 = 10)

5.

Attempt any two parts of the following:

- (a) Compare between electric circuit and equivalent magnetic circuit. Draw and explain B-H curve for a magnetic material. Explain the factors which affect hysteresis loss. How hysteresis loss depends on the area of hysteresis loop.
- (b) An iron ring is made up of two different materials A and B having a relative permeability of 1000 and 1500 respectively. The mean length of the two material L_A and L_B are 75 cm and 25 cm respectively. The air gap length is 2 mm. The cross sectional area of the core is 10 cm^2 . The magnetizing coil has 1000 turns and a current of 5 A is allowed to flow through it. Calculate the flux produced in the air gap.
- (c) Explain leakage flux. What is meant by coefficient of coupling in a magnetic circuit? Define self and mutual inductance and derive relation of self inductances and mutual inductance between mutually coupled magnetic circuits.

(b) i) Write the names and structures of the monomers used for each of the following polymers. 5
a) PAN, b) Nylon-6, c) Teflon, d) PVC, e) SBR, f) NBR, g) PGA, and h) Nylon 6,6

ii) List out the differences between LDPE and HDPE.

(c) What are fuels? How are they classified? Give suitable examples of each class. 5
The temperature of 950.0 g of water increased from 25.5 °C to 28.5 °C on burning 0.75 g of a solid fuel in a bomb calorimeter. Water equivalent of calorimeter and latent heat of steam are 400.0 g and 597.0 cal/g respectively. If the fuel contains 0.65% of hydrogen, calculate its net calorific value.

Q 4 Attempt any two of the following. 5

(a) What is the purpose of IR? Why KBr pellet is used in IR? What are the differences between stretching vibration and bending vibrations? Why acetone has lower absorption frequency (1715 cm⁻¹) as compared to acetaldehyde (1745 cm⁻¹)? 5

(b) The concentration of t-RNA in an aqueous solution is 10 M. The absorbance is found to be 0.209 when this solution is placed in a 1.00 cm cuvette and 258 nm radiations are passed through it. 5
a) Calculate the specific absorptivity, including units, of RNA.
b) What will be the absorbance if the solution is 5 M?
c) What will be the absorbance if the path length of the original solution is increased to 5.00 cm?

(c) Molecules like H₂, N₂, and O₂ are infrared inactive molecules whereas in CO₂ molecule some of vibrational modes are IR active. Give the comment. 5
A CuSO₄ solution shows a transmittance of 90% when taken in a cell of 1.9 cm thickness. Calculate its concentration. If the molar absorption coefficient is 5000 l/mol/cm

Q 5 Attempt any two of the following 5

(a) Describe ion exchange method of demineralization of water. 5

(b) What is an absorption spectra? Write what do you know about $\sigma \rightarrow \sigma^*$, $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ and $n \rightarrow \sigma^*$ transitions? Define functional and finger print regions. How many vibrational modes are there in a linear and a non linear molecules having n atoms? Explain with the help of degree of freedom 5

(c) i) Which of the following will exhibit higher value of λ_{max} in the UV spectra and why? 5
a) CH₃COCH₃ and CH₂=CHCOCH₃
b) CH₂=CH-CH=CH-CH₂-CH₃ and CH₂=CH-CH=CH-CH₂-CH₃

ii) Compare the C=O stretching absorption in the following compounds
a) HCHO b) CH₃CHO and c) CH₃COCH₃

iii) What is TMS in organic chemistry? Predict the number of NMR signals and their splitting in the following compounds.

a) t-Butylamine b) Benzene c) Propanol d) Ethyl acetate e) Pentan-2-ene. f) Butyraldehyde g) 4-Aminopentan-2-ol and h) 1, 1-Dibromopropane

(c) Draw the circuit of an OP-AMP integrator and derive the expression for its output voltage in terms of input voltage.

Attempt any two parts of the following

(2x5)=10

(a) Plot the logical expression.

$$ABCD + A\bar{B}\bar{C}D + A\bar{B}C + AB$$

On a 4 variable K Map. Obtain the simplified expression from the map.

Boolean algebra

(b) Convert the following numbers as directed with procedures.

(i) $(4021.25)_{10} = ()_2$

(ii) $(A6F, CD)_{16} = ()_9$

(iii) $(2AC9)_{16} = ()_7$

(iv) $(725.25)_{10} = ()_{16}$

(v) $(7841)_9 = ()_{10}$

numbering system

(c) State and Prove following properties and laws of Boolean algebra.

(i) Distributive property

(ii) Consensus Laws

Attempt any two parts of the following

(2x5)=10

(a) State the advantages of DVM over an analog meter. Explain the basic principle of DVM.

(b) Describe the Working of CRO with the help of block diagram. Mention the practical applications of CRO.

(c) Explain the operation of basic Digital Multimeter with block diagram. How current and resistance can be measured?

DMM

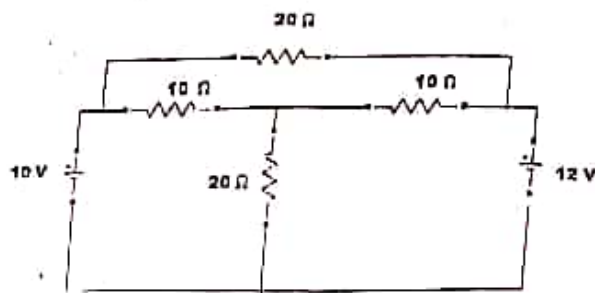


Figure.3

- (d) The equation of an alternating current is $42.42 \sin 628t$, determine its; (i) maximum value, (ii) frequency, and (iii) form factor.
- (e) A series R-L-C circuit has 100Ω resistor, 0.318 H inductance and C. If supply voltage across this circuit $v = 230\sqrt{2} \sin \omega t \text{ V}$, and $i = 2.3\sqrt{2} \sin \omega t \text{ A}$; find: (i) the value of capacitance C, (ii) voltage across inductor, and (iii) power absorbed by circuit.
- (f) In a series RL circuit explain: power factor, active power, reactive power and apparent power by drawing the following: (i) Impedance triangle, (ii) Power triangle.
- (g) Two admittances $Y_1 = (0.01 + j0.02) \text{ S}$, and $Y_2 = (0.02 - j0.01) \text{ S}$ are connected in parallel across a supply of 100 V . Find the current drawn from the supply.

2. Attempt any two parts of the following:

(2 × 5 = 10)

- (a) An a.c. supply is suddenly switched on to a series R-L load, draw the relevant waveforms for different switching instant and also derive the expression of currents for such switching instants.
- (b) A supply voltage of 24 V is switched on to a circuit with a resistance of $1 \text{ k}\Omega$ and a capacitance of $1000 \mu\text{F}$ in series. Find (i) the time constant of the circuit, (ii) initial rate of rise of capacitor voltage, (iii) the rate of rise when the voltage is 10 V , and (iv) voltage and current after 2 second of switch on.
- (c) Discuss the transient response of series RLC circuit with step input and explain over damping, critical damping and under damping.

3. Attempt any two parts of the following:

(2 × 5 = 10)

- (a) Find the trigonometrical Fourier series for the full wave rectified voltage sine wave as shown in figure, 4

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B. Tech.
Year 1st Semester 1st (ODD SEMESTER)
(ECE, EE & ME)
Major Examination 2018-2019
FUNDAMENTALS OF ELECTRONICS ENGINEERING

M.M.: 50

Attempt all the questions. Each question carries equal marks.

(5x2) = 10

Attempt any Five parts of the following.

- Give the classification of materials on the basis of Electrical behaviour. Explain each with the help of simple energy band diagram.
- Draw V-I Characteristic curve of Si diode in forward and reverse bias. Write volt ampere equation and elaborate all terms used.
- Determine the rating of a transformer to deliver 100 watts of d.c. power to a load under FWR. Assume $V_{dc} = 10V$.
- Discuss Early effect in transistor. Mention its consequences.
- What are the advantages of h parameters for transistor amplifier analysis? Draw the small signal model of BJT amplifier using h parameters at low frequency in CE configuration.
- Draw the circuit of zener diode voltage regulator with series resistance R_s and load resistance $R_L = 120 \text{ ohm}$. Calculate the value of R_s if output is maintained at $V_z = 6.2V$.
- Write short notes on any two of the following.
 - Transition and diffusion capacitance of p-n junction
 - Clipper circuits
 - Voltage Doublers

(2x5)=10

2. Attempt any two parts of the following.

- Why N channel MOSFETS are preferred over P channel MOSFETS? With the help of suitable diagram explain the working of P Channel DMOSFET. Indicate its Characteristics.

(b) Establish the relation

$$g_m = g_{m0} \left(1 - \frac{V_{GS}}{V_p}\right)$$

where symbols have their usual meaning.

BEE-02

Roll No.

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B. Tech.I (EE & ECE)
I-SEMESTER
MAJOR EXAMINATION 2018 - 19

Subject Name: Electrical Circuits and Analysis

Max. Marks: 50

Time: 3 Hrs.

Note: Attempt all questions. Each question carry equal marks.

(5x2=10)

1. Attempt any five parts of the following:

- (a) Using nodal analysis find current I as shown in the circuit diagram of figure.1

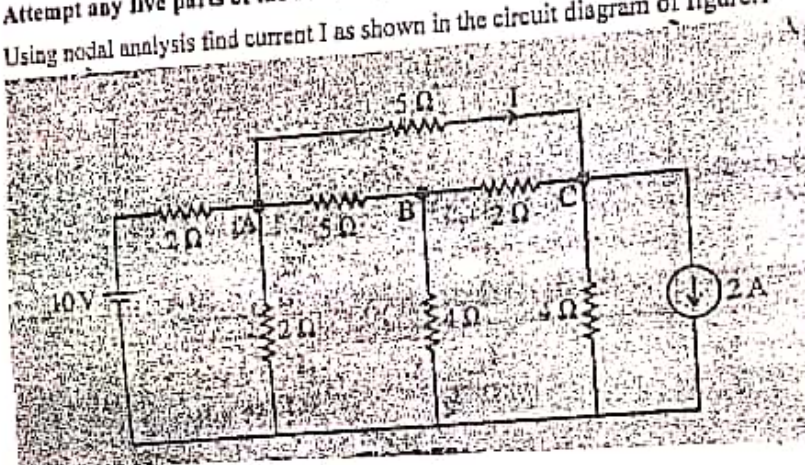


Figure.1

- (b) Find the voltage across 5Ω resistance using Thevenin's theorem as shown in circuit diagram of figure.2

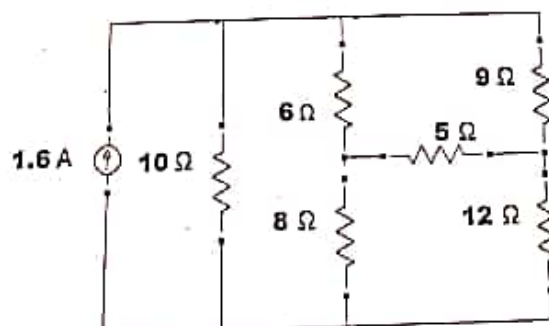


Figure.2

- (c) Find mesh currents for the circuit shown in figure.3

(ii) Evaluate

$$\int_0^1 \frac{x^2 dx}{(1-x^4)^{1/2}} \times \int_0^1 \frac{dx}{(1+x^4)^{1/2}}$$

- (c) By means of substitution $x + y + z = u$, $y + z = uv$, $z = uvw$, evaluate the value of $\iiint x^{-1/2} y^{-1/2} z^{-1/2} (1-x-y-z)^{1/2} dx dy dz$ taken over the volume bounded by $x = 0, y = 0, z = 0$ and $x + y + z = 1$.

3. Attempt any two parts of the following:

(2 × 5 = 10)

(a) Show that $\beta(m, n) = \int_0^1 \frac{x^{m-1}}{(1+x)^{m+n}} dx = \int_0^1 \frac{x^{n-1}}{(1+x)^{m+n}} dx = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$

(b) (i) Show that

$$\Gamma\left(\frac{1}{n}\right) \Gamma\left(\frac{2}{n}\right) \Gamma\left(\frac{3}{n}\right) \dots \Gamma\left(\frac{n-1}{n}\right) = \frac{(2\pi)^{(n-1)/2}}{n^{1/2}}$$

(ii) Evaluate $\int_0^\infty e^{-ax} x^{n-1} \cos bx dx$ in terms of Gamma function. Use it to evaluate

$$\int_{-\infty}^\infty \cos x^2 dx$$

(c) Evaluate $\iiint \sqrt{a^2 b^2 c^2 - b^2 c^2 x^2 - c^2 a^2 y^2 - a^2 b^2 z^2} dx dy dz$ taken throughout the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.

4. Attempt any two parts of the following:

(2 × 5 = 10)

(a) (i) A fluid motion is given by $\vec{v} = (y \sin z - \sin x)\vec{i} + (x \sin z + 2yz)\vec{j} + (xy \cos z + y^2)\vec{k}$. Is motion irrotational? If so, find the velocity potential.

(ii) Show that $\text{div} \left\{ \text{grad} \left(\frac{x}{r} \right) \right\} = 0$, where r is the magnitude of position vector $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$.

(b) Evaluate $\iint_S \vec{F} \cdot \vec{n} dS$, $\vec{F} = 18xz\vec{i} - 12z\vec{j} + 3y\vec{k}$ and S is the surface of the plane $2x + 3y + 6z = 12$ in the first octant.

(c) Verify divergence theorem for $\vec{F} = 4x\vec{i} - 2y^2\vec{j} + z^2\vec{k}$ taken over the region bounded by cylinder $x^2 + y^2 = a^2$, $z = 0$, $z = b$.

5. Attempt any two parts of the following:

(2 × 5 = 10)

(a) (i) Find the greatest value of the directional derivative of $\phi(x, y, z) = 2x^2 - y - z^4$ at $(2, -1, 1)$.

(ii) Find the directional derivative of $xyz^2 + xz$ at $(1, 1, 1)$ in the direction of the normal to the surface $3xy^2 + y + z$ at $(0, 1, 1)$.

(b) Verify Green's theorem in a plane for $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C encloses the region bounded by $y = \sqrt{x}$ and $x = \sqrt{y}$.

(c) (i) Apply Stokes' theorem to evaluate $\int_C y dx + z dy + x dz$, where C is the curve of intersection of $x^2 + y^2 + z^2 = a^2$ and $x + z = a$.

(ii) Prove that $\int_C \vec{r} \cdot d\vec{r} = 0$, where $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$.

5.

Attempt any two parts of the following:

(2 × 5 = 10)

- (a) Describe the construction and working of He-Ne Laser. How it is superior to a Ruby laser.
- (b) Describe the Propagation Mechanism of optical signals through optical fiber with suitable ray diagram.
- (c) Explain the following terms:
- (i) Numerical aperture
 - (ii) Acceptance angle
 - (iii) Acceptance cone

Unit-4

(2x 5 = 10)
to a Ruby laser.
with suitable ray

BAS-06

Roll No.

2018021123

B.Tech
(SEM I) ODD SEMESTER
MAJOR EXAMINATION 2018-2019
SPACE SCIENCE

Max. Marks: 50

Time: 3 Hrs.

Note: Attempt all questions. Each question carries equal marks.

(5x2)

1. Attempt any four parts of the followings:

- Classify telescopes into different types and sketch ray-diagram of each.
- Describe the construction and function of Charge Coupled Device (CCD). Also highlight its importance.
- Write down nuclear reactions involved in CNO cycle.
- Explain the construction and function of X-rays telescopes. Why are the X-rays collected at small glancing angles?
- Discuss different cases of bound and un-bound orbits along with energy conditions.
- The force acting on a planet is given by the following equation-

$$f = -\frac{l^2 u^2}{m} \left(\frac{d^2 u}{d\theta^2} + u \right)$$

Here, the terms have their usual meanings. If $r = \frac{p}{(1 + e \cos \theta)}$; then show that the force obeys the inverse square law. (e and p are constants).

- Derive Newton's law of gravitation from Kepler's law of planetary motion.

(2x5)

2. Attempt any two parts of the followings:

- Describe the formation of our solar system from a solar nebula with the help of neat and clean diagram.
- Draw Hubble's tuning fork diagram and explain morphological evolution of galaxies.

(c) Why do "Pulsars" emit radiation? Explain with the help of neat and clean diagram.

3. Attempt any two parts of the followings:

(2×5)

(a) Explain the formation of a "White Dwarf" star. How does it achieve its equilibrium structure?

(b) Draw neat and clean Hertzsprung-Russel (HR) diagram and explain the life cycle of an averaged sized star in it.

(c) Why are "Black holes" not visible? Account reasons for it.

4. Attempt any two parts of the followings:

(2×5)

(a) Describe Hubble's law of expanding Universe. Highlight the discrepancy in Hubble's observation.

(b) Discuss about cosmic background radiations coming from different parts of the Universe and explain black body radiation curve of the Universe.

(c) Starting from the Friedmann's equation, obtain the condition for closed model of the Universe and explain it.

5. Attempt any two parts of the followings:

(2×5)

(a) Classify dark matter into different categories and comment on each.

(b) Explain different stages of evolution of the Universe with the help of neat and clean diagram.

(c) Comment on term "Cosmic Shower".

Roll No.

20180310128

B. Tech. I Semester
 ODD SEMESTER
 MAJOR EXAMINATION 2018 - 2019

Subject Name: : Engineering Mathematics-I

Max. Marks: 50

Time: 3 Hrs.

Attempt all questions. Each question carry equal marks.
 Attempt any five parts of the following:

(5 × 2 = 10)

(a) If $u = \sin nx + \cos nx$, then show that $u_r = n^r [1 + (-1)^r \sin 2nx]^{1/2}$, where u_r is the r^{th} differential coefficient of u w.r.t. x .

(b) If $u = \sin^{-1} \left[\frac{x^{1/4} + y^{1/4}}{x^{1/4} + y^{1/4}} \right]$, then find $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$.

(c) Expand $\sin(m \sin^{-1} x)$ in ascending power of x .

(d) Using $x = r \cos \theta$, $y = r \sin \theta$, transform the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ into polar form as

$$\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \frac{\partial u}{\partial r} + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0.$$

(e) Show that the equations $3x + 4y + 5z = a$, $4x + 5y + 6z = b$, $5x + 6y + 7z = c$ do not have solution unless $a + b = 2c$.

(f) Find the rank of the matrix

$$\begin{bmatrix} 2 & 3 & -2 & 4 \\ 3 & -2 & 1 & 2 \\ 3 & 2 & 3 & 4 \\ -2 & 4 & 0 & 5 \end{bmatrix}$$

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

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

(2 × 5 = 10)

2. Attempt any two parts of the following:

(a) (i) Evaluate

$$\int_0^{\infty} \int_0^x x e^{-\frac{x^2}{y}} dx dy$$

(ii) Solve by using change of order of integration

$$\int_0^a \int_0^{\frac{b}{b+x}} x dy dx$$

(b) (i) Find the volume bounded by the surfaces $x^2 + y^2 = 1 + z$ and $z = 0$.

P.T.O.