Enrolment No. | | | | | | | | | | |

S4(UBE04C17)BE

B.Tech 4th Semester Mid-Term Examination, 2018-19

Numerical Methods

Paper Code: UBE04C17

Full Marks: 50 **Time: 2 hours**

The figures in the margin indicate full marks for the questions

Part-I (25 marks)

Answer ANY FIVE questions. Each question carries 5 marks.

1. Convert decimal 1.7 in an 8-bit floating point format. Assume the format uses 1 bit for sign, 3 bits for biased exponent (bias =3), 4 bits for mantissa.
2. Determine the largest positive number that can be stored in a MATLAB variable.
3. Consider a hypothetical floating point number set for a machine that stores information using 4 bits (including implicit bit for normalized representation) of precision and an exponent range of -1 to +1. Determine the machine epsilon for such a system.
4. State Taylor's theorem.
5. For $f(x) = 7e^{0.5x}$, find absolute relative true error in calculating $f'(2)$ for h = 0.3. Also calculate absolute relative approximate error in changing h value from h = 0.30 to h = 0.15.
6. Derive Taylor's series for e^x at point x=0 and find the bounds of the truncation error in the evaluation of e^1.

Part-II (25 marks)

Answer all the questions (internal choices are provided)

1. Estimate one of the root locations for the polynomial $f(x) = x^4 - 15x^3 + 30x^2 - 24$ using (a) bisection method, (b) regula falsi method. Take an initial estimate of ~~$x_l = 3$ and $x_u = 1$~~ till a stopping criterion of $\varepsilon_a = 7\%$ is reached. **[5]**

2. Estimate one of the roots of the equation $x^6 - 1.5x^3 - 30x^2 - 124$ using (a) Newton-Raphson method, (b) secant method. Use an initial estimates of x_0=-5 and x_{-1}=-6 (for secant method) and a stopping criterion of $\varepsilon_a = 0.1\%$. **[10+10=20]**

(or)

Describe how roots are found using Müller's method. Find out any one of the roots of the polynomial $f(x) = 5x^4 + 16x^2 - 52x - 24$ using Müller's method by taking initial guesses of 2, 2.5 and 3.5 up to a stopping criterion (ε_a)=0.5%. **[20]**

Enrolment No. 17UBE003

S_4(UBE04C18)BE

B.Tech. 4th Semester Mid- Term Examination 2019

Subject Name: Principles of Management and Managerial Economics

Paper Code: UBE04C18

Full marks: 50 ***Time: 2 hours***

The figures in the margin indicate full marks

Answer all questions.

1. Following are the information of SEZ Co. Ltd:
Expected Earnings Before Interest and Tax (EBIT) is Rs. 2, 00,000. Corporate tax to be paid @ 50%

	Plan X (Rs.)	Plan Y (Rs.)	Plan Z (Rs.)
Equity share (Rs.100 each)	50,000	25,000	20,000
6% debentures	50,000	75,000	80,000
Total	1,00,000	1,00,000	1,00,000

You are required to calculate Earnings Per Share (EPS) and Financial leverage, Also give your comment. ***(10)***

2. The following figures are available from the books of P Ltd.

Year	Sales	Profit
2017	3,00,000	30,000
2018	4,00,000	80,000

Calculate: (i) Fixed cost, (ii) Break-Even sales, (iii) Variable cost for 2017 and 2018 and (iv) Sales required to earn a profit Rs 1,50,000 (v) Profit volume ratio ***(2×5=10)***

3. What do you mean by the terms Capital Structure and Optimum Capital Structure? What are the features of capital structure? ***(1+2+3=6)***

4. *Explain the terms* Break-Even point and Pay Back Period. ***(2+2=4)***

5. *Define market. Discussion the classification of market on the basis of geographical area. Explain the salient features of perfect competition. What is the condition of equilibrium of a firm under perfect competition?* ***(2+3+3+2=10)***

6. Explain the short run equilibrium of firm under perfect competition. Distinguish between perfect competition and monopoly. What is the shape of MR curve of a firm under perfect competition? ***(5+3+2=10)***

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BE (4th)

Enrolment No. 17UBE003

S3(UBE04B05)BE

B.Tech 4th Semester Mid Term Examination, 2019
Microbial Molecular Biology and Genetics
Paper Code: UBE04B05

Full Marks: 50 **Time: 2 hours**

A. Answer the following question (Any five) **2X 5=10**

1. What is the role of RNA primers in DNA replication?
2. Telomeres are special and necessary for the proper replication of eukaryotic chromosomes. Telomeres are not required for the replication of bacterial chromosomes. What important role do telomeres serve?
3. How did Louis Pasteur counter this argument and disprove spontaneous generation?
4. Clearly write the features that distinguish Archaea from Bacteria
5. Clearly state the reasons of different phases of growth curve in batch culture of bacteria.
6. Explain the functions of the cell membrane and wall and how these functions are essential to the growth and persistence of prokaryotes.

B. Answer the following question (5 marks each) **2X 5=10**

1. In the fruit fly Drosophila melanogaster, DNA replication at a single replication fork occurs at a rate of about 2600 nucleotide pairs per minute. The DNA molecule occurring in one of the largest chromosomes of this species has been estimated to contain $6x10^7$ nucleotide pairs.
   a. If replication of this molecule was initiated at a single origin in the middle of the chromosome, estimate the time, in days, required for complete replication of the chromosome.
   b. Estimates based on living cells indicate that this chromosome replicates in about four minutes. Assuming that the origins are spaced equally along the DNA, how many of them would be required to completely replicate this chromosome in four minutes?

2. The genes for hemophilia, a condition that causes blood not to clot properly, are located on the X chromosome. It is a recessive disorder. A man normal for blood clotting and a woman who is a carrier of the condition but still clots normally have children. Show the cross and answer the following questions.
   a. What is the percentage of children who are female with normal clotting?
   b. What is the percentage of children who are female with hemophilia?
   c. What is the percentage of children who are male with normal clotting?
   d. What is the percentage of children who are male with hemophilia?

C. Write short note on (Any two) **2.5X 2=5**

1. Gradient centrifugation
2. Methods of microbial sterilization
3. Gram negative bacterial cell wall

D. Answer the following question (Any Five) **5x3=15**

1. What are the functions of DNA polymerase III in DNA replication?
2. List five differences between DNA and RNA
3. The chromosomes of our cells contain immensely long DNA molecules. Describe how they are compacted

inside a cell.

4. How can the speed of DNA replication increase in human cell while the rate of replication remains constant?
5. Explain semi-conservative replication.
6. Describe the one experiment with logical support which indicated that DNA is the genetic material.

E. Mark the correct answer only- (1 mark each): **1X 10=10**

1. **The most important vitamin for the growth of bacteria is**
   a) B-complex b) Vitamin A c) Vitamin D d) Vitamin C
2. **The organisms which can grow both in presence and absence of oxygen**
   a) Aerobes b) Anaerobes c) Faculative anaerobes d) Strict aerobes
3. **Drawbacks to the use of heavy metals as microbial control agents include**
   a) toxicity to humans b) propensity for causing allergic reactions c) development of microbial resistance d) two of the above e) all of the above
4. **Sterilization of culture media containing blood serum or eggs (which break down at slightly more than 100^{0}C) may be accomplished using**
   a) pasteurization b) a dry oven c) UV irradiation d) sonication e) intermittent sterilization
5. **The enzyme used in the polymerase chain reaction is isolated from a/n _____ bacteria**
   a) osmophilic b) mesophilic c) thermophilic d) psychrophilic e) none of the above
6. **Which of the following drugs works by inhibiting cell wall production**
   a) sulfonamides b) streptomycin c) erythromycin d) chloroquine e) cephalosporin
7. **Synthesizing DNA requires a/an _____ primer which is synthesized by _____**
   a) RNA, gyrase b) DNA, ligase c) protein, primase d) RNA, primase e) DNA, helicase
8. **Compared to a typical bacterial chromosome, a typical plasmid is about**
   a) the same size b) slightly larger c) 100 times larger d) 10 times smaller e) 1000 times smaller
9. **A cofactor may be a**
   a) coenzyme b) metal ion c) holoenzyme d) two of the above e) all of the above
10. **Resistance to antibiotics may be spread from one bacterium to another by means of**
    a) conjugation b) transduction c) transformation d) two of the above e) all of the above

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S4(UBE04B04)BE

B.Tech 4th Semester Mid Term Examination, 2019
Physics for Bioengineering
Paper Code: UBE04B04

Full Marks: 50 **Time: 2 hours**

The figures in the margin indicate full marks for the questions
Candidates are required to give their answers in their own words as far as practicable

I. Answer the questions from the following (Any Five) **5x3=15**

1. Why is it not possible for an electron to continue in a set orbit around the nucleus like a planet around the sun?
2. What is the de Broglie wavelength of a 10.0 gram whip traveling at the speed of sound? The speed of sound is 331 m/s.
3. Explain how atomic structure violates Coulomb's law.
4. Based on Thomson's Plum Pudding model, how did Rutherford expect the alpha particles to behave when he shot them at the gold atoms? Why?
5. How is deBroglie's view of the electron different from Bohr's view?
6. Why Compton effect is not observed experimentally for visible rays?
7. What are the two longest wavelengths that could be absorbed by a He^+ ion in its ground state?

II. Answer the following questions. **5x2= 10**

1. A small drop of oil of mass m which carries a charge Q may be held stationary in a vertical electric field of intensity E.
   a) Write down the expression for the forces on the drop which are then in balance
   b) Describe how this apparatus can be used to measure
   c) Explain how the results of such an experiment indicate that all charges consist of an integral number of basic units of charge.
2. The atomic nucleus may be considered to be a sphere of positive charge with a diameter very much less than that of the atom. Discuss the experimental evidence that supports this view. Discuss briefly how this experimental evidence has been obtained?

III. Answer the questions from the following. **5x5=25**

1. How much energy (in MeV units) must an alpha particle have to reach the surface of a gold nucleus ($Z = 79$, $A = 197$)? Assume the gold nucleus remains stationary.
2. The decay constant of a radioactive nuclide is $1.6 \times 10^{-3}\ s^{-1}$. At a given instant, the number of atoms of the radioactive nuclide is 1.85×10^{12}. Calculate the number of atoms of the nuclide that remain after a time interval of 30 minutes.
3. The nitrogen atom $^{14}_{7}N$ is composed of 7 protons and 7 neutrons, which gives a total of 14 atomic mass units (a.m.u). But if these particles are combined into a $^{14}_{7}N$ nitrogen nucleus, the resulting mass of the nitrogen nucleus is 14.003074 u.

(a) Find the mass defect of the nitrogen nucleus.
(b) What is the binding energy of the nitrogen nucleus?
(c) What is the binding energy per nucleon?

4. A beam of x-rays with wavelength 0.2400 nm is directed toward a sample. The x-rays scatter from the electrons within the sample, imparting momentum to the electrons, which are initially at rest in the lab frame. After scattering, the x-rays are detected at various angles relative to the direction of the incoming beam using a detector that can resolve their wavelengths.
(a) What is the longest wavelength measured by the detector?
(b) At what scattering angle does this occur?

5. Define the mass defect and the binding energy of an atom. Find the mass defect and the binding energy of the deuteron (^{2}H) nucleus. The experimental mass of the deuteron is 3.3435×10^{-27} kg.

Equations and conversion factors that may be useful:

$$x = x_o + v_{ox}t + \tfrac{1}{2}a_x t^2 \qquad v_f = v_0 + at \qquad v_f^2 = v_o^2 + 2ax \qquad \mathbf{F} = m\mathbf{a} \qquad F_g = G\frac{m_1 m_2}{d^2}$$

$$1\,\text{m} = 3.28\,\text{ft.} \qquad 1\,\text{mi} = 1.61\,\text{km} \qquad 1\,\text{m/s} = 2.24\,\text{mi/h} \qquad 1\,\text{lb.} = 4.45\,\text{N} \qquad c = 3.00\times10^8\,\text{m/s}$$

$$M_{\text{Earth}} = 5.98\times10^{24}\,\text{kg} \qquad R_{\text{Earth}} = 6.38\times10^6\,\text{m} \qquad G = 6.67\times10^{-11}\,\text{N}\cdot\text{m}^2/\text{kg}^2 \qquad g = 9.80\,\text{m/s}^2$$

$$\gamma = 1/\sqrt{1-v^2/c^2} \qquad t = t_o\gamma \qquad L = L_o/\gamma \qquad m = m_o\gamma \qquad p = m_o v\gamma \qquad E = m_o c^2\gamma$$

$$E = hf \qquad p = E/c \qquad \lambda = h/p \qquad \Delta p_x \Delta x \geq h/2\pi \qquad \Delta E \Delta t \geq h/2\pi \qquad h = 6.63\times10^{-34}\,\text{J}\cdot\text{s}$$

$$E_n = -\frac{ke^2}{2a_o}\frac{Z^2}{n^2} \qquad r_n = n^2\frac{a_o}{Z} \qquad a_o = 5.29\times10^{-11}\,\text{m} \qquad L = \sqrt{l(l+1)}\,\frac{h}{2\pi} \qquad L_z = m_l\frac{h}{2\pi}$$

$$r = (1.2\times10^{-15}\,\text{m})A^{1/3} \qquad N = N_o e^{-\lambda t} \qquad t_{1/2} = \frac{\ln 2}{\lambda} \qquad 1\,\text{u} = 1.660540\times10^{-27}\,\text{kg} \qquad 1\text{G} = 10^{-4}\,\text{T}$$

$$\varepsilon_o = 8.85\times10^{-12}\,\text{C}^2/(\text{N}\cdot\text{m}^2) \qquad \mu_o = 4\pi\times10^{-7}\,\text{T}\cdot\text{m/A} \qquad m_p = 1.67\times10^{-27}\,\text{kg}$$

$$e = 1.602\times10^{-19}\,\text{C} \qquad k = \frac{1}{4\pi\varepsilon_o} = 8.99\times10^9\,\text{N}\cdot\text{m}^2/\text{C}^2 \qquad m_e = 9.11\times10^{-31}\,\text{kg}$$

$\Delta x \Delta v \approx h/m$, $\quad m_p = 1.007277$ amu, $\quad m_n = 1.008665$ amu, $\quad m_e = 0.000549$ amu