DTU/11/1014

Total No. of Pages 2 Roll No. .....

FIRST SEMESTER B.Tech. (ALL)

END SEMESTER EXAMINATION NOV.-DEC.-2011

AM-101 MATHEMATICS-I

Time: 3 Hours *Maximum Marks : 70*

Note : Answer *ALL* by selecting *TWO* parts from each question. Assume suitable missing data, if any.

1[a] State Cauchy's integral test. Hence or otherwise discuss the convergence of $\sum \frac{1}{n^p}$.

[b] Discuss the convergence and absolute convergence of the following series;

$$x - \frac{x^2}{2} + \frac{x^3}{3} \dots\dots\dots + (-1)^{n+1}\frac{x^n}{n} + \cdots \dots\dots$$

[c] Calculate the approximate value of $\sqrt{17}$ by choosing a suitable function and writing its Taylor's series, correct upto 4th decimal place.

7+7

2[a] Show that the curvature at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ on the folium $x^3 + y^3 = 3xy$ is $-\frac{8\sqrt{2}}{3a}$.

[b] Find the surface area of the solid generated by revolving an arc of the cycloid $x = a(\theta - sin\theta)$, $y = a(1 - cos\theta)$ $0 \le \theta \le 2\pi$ about the x-axis.

[c] Find the area included between the cardiod $r = a(1 + cos\theta)$ and the circle $r = a$.

7+7

3[a] If $u = log(x^3 + y^3 + z^3 - 3xyz)$, show that

$$\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 . u = \frac{-9}{(x+y+z)^2}$$

[b] Locate the stationary point of
$f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$ and determine their nature.

[c] At a distance of 50 meter from the foot of a tower, the elevation of its top is 30°. The possible errors in the measuring of distance and the elevation are 2 cm and 0.05 degree respectively. Find the approximate error in the calculated height.

7+7

4[a] Evaluate $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{xdydx}{\sqrt{x^2+y^2}}$ by changing in the polar co-ordinates

(ii) Show that $\Gamma n = \int_0^1 \left(\log \frac{1}{y}\right)^{n-1} .dy$

[b] Find the volume bounded by cylinder $x^2 + y^2 = 4$ and the hyperboloid $x^2 + y^2 - z^2 = 1$

[c] Find the volume bounded by xy-plane, the cylinder $x^2 + y^2 = 1$ and the plane $x + y + z = 3$

7+7

5[a] (i) If $u = x + y + z$, $v = x^2 + y^2 + z^2$ $w = yz + zx + xy$ prove that grad u, grad v and grad w are coplanar.

(ii) Find whether the vector field $\bar{F} = \cosh(x + y)(\hat{\imath} + \hat{\jmath})$ is conservative.
If it is so, find the potential function.

[b] State the Divergence theorem. Verify it for $\bar{F} = 4xz\hat{\imath} - y\hat{\jmath} + yz\hat{k}$ taken over the cube bounded by the planes $x = 0 = y = z$ and $x = 1 = y = z$.

[c] Verify Green's theorem in the plane for $\int_c [(3x^2 - 8y^2)dx + (4y - 6xy)dy]$ where C is the boundary of the region bounded by $x = 0$, $y = 0$ and $x + y = 1$.

7+7

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FIRST SEMESTER **B.Tech. (Group A)**

END SEMESTER EXAMINATION **NOV.-DEC.-2011**

HU-102 COMMUNICATION SKILLS

Time: 3 Hours ***Maximum Marks : 70***

Note : Answer ***ALL*** questions.
Assume suitable missing data, if any.

1 Give reference to context for the following (***any three***)

[a] Pride can never approach to where thou walkest in the clothes of the humble among the poorest, and lowliest, and lost.

[b] Like a flock of homesick cranes flying night and day back to their mountain nests let all my life take its voyage to its eternal home in one salutation to thee.

[c] Where the mind is led forward by thee into ever-widening thought and action. Into that heaven of freedom, my father, let my country awake.

[d] Deliverance is not for me in renunciation I feel the embrace of freedom in a thousand bonds of delight.

15

2[a] Explain the thematic relevance of "Wings of Fire" as title for Dr. APJ Abdul Kalam's autobiography.

OR

[b] In his autobiography "Wings of Fire", Dr. Kalam highlights that "Power" should be measured in terms of external as well as internal strength. Discuss. **10**

3 Read the following passage and answer the questions given below:

Even the rational thought-matrices of science have been home to fairy tales. I am an avid reader of books on cosmology and enjoy reading about celestial bodies. Many friends while asking me questions related to space flights, sometimes slip into astrology. Quite honestly, I have never really understood the reason behind the great importance attached by people to the far away planets in our solar system. As an art, I have nothing against astrology, but if it seeks acceptance under the guise of science, I reject it.. I do not know how these myths evolved about planets, star constellations and even satellites – that they

can exercise power on human beings The highly complicated calculations manipulated around the precise movements of celestial bodies, to derive highly subjective conclusions appear illogical to me. As I see it, the Earth is the most powerful and energetic planet.

[a] Explain the meaning of "rational thought matrices of science". 2

[b] What are the author's views on astrology? 2

[c] What appears illogical to the author? 2

[d] Add prefix to make antonyms :

(i) Rational (ii) Precise 2

[e] Use the following words to make sentences:

(i) Guise (ii) Avid 2

4 Use the following idioms in sentences of your own:

[a] A leap in the dark

[b] At the receiving end

[c] Moving the goal posts

[d] Entering a minefield 2

5 Make sentences with the following pair of words:

[a] Adverse , averse

[b] Council, counsel

[c] Momentary, momentous 3

6 Give phonetic transcriptions for the following words : (*Any six*)

[a] Circle ˈsɜːkl

[b] Heir hɪə

[c] Length leŋθ

[d] Know nəʊ

[e] Swing swɪŋ

[f] Thereby ðɪəˈbaɪ

[g] Tap tæp

[h] Fly flaɪ

[i] Think θɪŋk 6

7 Add Question Tags to the following statements

[a] They went with you,.....?

[b] Prakash is looking for a coach,.....?
[c] You will come, ...?
[d] He doesn't say much, ...? 4

8 Fill in the blanks with appropriate verb and tense forms (as specified in the first and second bracket respectively).
[a] The window.....by some boys. (Break) (past tense)
[b] Will you ..... next week ?(Work), (future continuous)
[c] Birds ..... south in the winter. (fly) (Simple Present)
[d] She ..... the microwave a year ago (buy) (Simple past)
[e] Rina ..... all the way from the college (walk) (present perfect) 5

9 Give technical descriptions of the following (any two)
[a] Solar heater
[b] Earthquake
[c] Electroplating 10

10 Write a brief essay on any one of the following:
[a] Technology for the poor
[b] Cyber Crime and the Youth
[c] Education system in India. 5

A-8. D10/11/104

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FIRST SEMESTER **B.Tech. (AP)**

END SEMESTER EXAMINATION **NOV.-DEC.-2011**

AP-103 APPLIED PHYSICS-I

Time: 3 Hours *Maximum Marks : 70*

Note : Answer any *FIVE* questions.
Assume suitable missing data, if any.

1[a] State the fundamental postulates of special theory of relativity. Derive Lorentz transformation equations for position & time. 7

[b] Show that the relativistic kinetic energy (K.E.) of a particle is given by

$$K.E. = (m - m_0)c^2$$

Where m and m_0 are relativistic and rest mass of the particle & c, the speed of light. 7

2[a] Obtain expression for relativistic addition of velocities using Lorentz transformation equations. 6

[b] The frequency of a damped simple harmonic oscillator is given by

$$\omega'^2 = \frac{s}{m} - \frac{r^2}{4m^2} = \omega_0^2 - \frac{r^2}{4m^2}$$ **2x4=8**

(i) $\omega_0^2 - \omega'^2 = 10^{-6}\omega_0^2$, calculate the values of quality factor and the logarithmic decrement.

(ii) If $\omega_0 = 10^6$ *and* $m = 10^{-10}$ *kg*. Calculate the stiffness of the system and the resistive constant.

(iii) If the maximum displacement at t=0 is 10^{-2}m, calculate the energy of the system and relaxation time for energy.

(iv) Calculate the energy loss in the first cycle.

3[a] Define quality factor of damped harmonic oscillator. Deduce its expression in terms of relaxation time. 7

[b](i) Explain the sharpness of resonance and explain the condition when resonance is sharp. 3½

(ii) Derive am expression for transverse wave in a string having linear density ρ and tension T. 3½

4[a] Derive an expression for the amplitude of forced vibrations of a mechanical system in steady state. 7

[b] Obtain an expression for reflection and transmission co-efficients of amplitude of longitudinal waves propagating from one medium to another medium. 7

5[a] Describe and explain the formation of Newton's rings with a suitable diagram for the reflected light system. Prove that in reflected light, diameters of the dark rings are proportional to the square root of natural numbers. 7

[b] Explain Rayleigh's criterion of resolution. Derive the expression for resolving power of a plane transmission grating. 7

6[a] What is meant by (i) plane polarized (ii) circularly polarized & (iii) elliptically polarized light? Briefly describe how these can be produced and detected using Nicol prism and quarter wave plate. 5

[b] A half wave plate is constructed for wavelength of 6000 Å. For what wavelength does it work as a quarter wave plate? 5

[c] Explain the following terms:

(i) Population Inversion

(ii) Point out the units of co-efficients of stimulated & spontaneous emission 4

7[a] What is the difference between step index and graded index optical fibres? Discuss the mechanism of light propagated in both types of fibres. Point out the advantages of graded index optical fibre over step index optical fibre. 5

[b] Draw the schematic diagram of He-Ne laser and describe its method of working. 5

[c] Explain the following terms:

(i) Numerical Aperture (N.A.)

(ii) Acceptance cone 4

8 Write short notes on the following: 3½ x4=14

[a] Spherical & Chromatic aberrations.

[b] Comparison between Huygens & Ramsden's eyepiece

[c] Zone plate

[d] Brewster's law

Total No. of Pages 3 *Roll No.* 1014

FIRST SEMESTER **B.Tech. (GROUP-A)**

END SEMESTER EXAMINATION **NOV.-DEC.-2011**

AC-104 APPLIED CHEMISTRY

Time: 3 Hours ***Maximum Marks : 70***

Note : Question No. *ONE* is compulsory.
Answer any *FIVE* questions from the rest.
Assume suitable missing data, if any.

1 Answer the following questions: **2x10=20**

[a] Draw the structural charges in case of methyl orange under the different pH conditions.

[b] Show the formation of A = T with structure.

[c] IR absorption frequency due to > C = 0 occurs at higher (υ) frequency than C = C. Why?

[d] Write the types of polymerization that may be carried out using the following initiators:

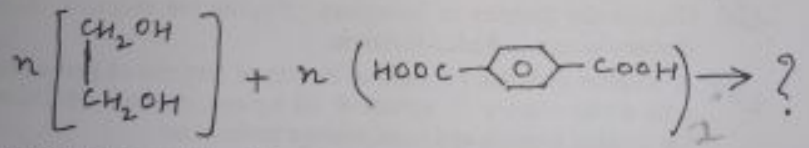
AIBN, RMgX, $TiCl_4$ / $AlMe_3$, BF_3 / H_2O

[e] What do you mean by T_g?

[f] Define Buffer. Give an example of acidic and basic buffer each.

[g] Explain the structural changes taking place during denaturation of proteins.

[h]



Complete the reaction. Name the product and its use.

[i] What is meant by an external indicator? Give an example.

[j] For a one component system, triple point is an invariant point? Comment.

2[a] Discuss characteristics of battery (any four). Discuss the toxic effluents from the battery industries. 4

[b] The following two step route (known as chlorohydrin route) is used for the industrial synthesis of ethylene oxide.

$$H_2C=CH_2+Cl_2+H_2O \rightarrow Cl-CH_2-CH_2-OH+HCl$$

$$Cl-CH_2-CH_2-OH+Ca(OH)_2 \rightarrow$$

$+ CaCl_2 + 2H_2O.$

Calculate the atom economy for the synthesis of ethylene oxide. 3

[c] Draw the phase diagram of Pb-Ag system. 3

3[a] Explain mutarotaion taking the help of glucose structure. Write the product when glucose is allowed to react with Br_2 water & Conc. HNO_3. 4

[b](i) How will you distinguish between CH_3COOH and CH_3COCH_3 with the help of IR spectra. 2

(ii) What are the wavelength ranges for visible and IR radiations? 2

[c] Write four important applications of thermo-gravimetry. 2

4[a] What is Zeigler Natta catalyst? Explain its significance. Classify polymers on the basis of their tacticity. 5

[b] What is the purity of conc. H_2SO_4 solution (sp. Gravity 1.8 g/ml) if 5.0 ml of this sol. is neutralised by 84.6 ml of 2.0 N NaOH? 3

[c] In the presence of O_2, draw DTA thermogram of calcium oxalate. 2

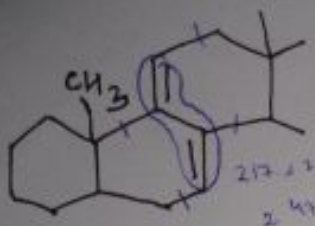
5[a] Discuss the theories of indicators. Explain the structural change in diphenylamine in Redox titrations. 5

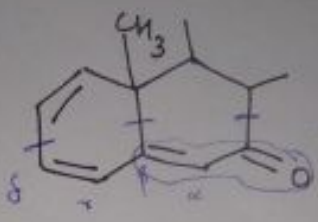
[b] A solution contains 1:2 ratio of masses of particles of two substances with molar masses 10 kg/mol & 20 kg/mol, respectively. Determine the number average and mass average molar mass. 3

[c] Write three criterion for the formation of solid solution. 2

6[a] Draw the structure of any trinucleotide. What are complete & incomplete proteins. Give an example of each. 6

[b] Calculate λ_{max} for the following compounds. 4





7[a] Write any five principles of green chemistry. Explain green solvents in detail. **5**

[b] What do you mean by enantiotropy? Draw and explain all the triple points existing in the phase diagram of sulphur. **5**

8 Short notes on any three: **10**

(i) Electroplating

(ii) Biocatalysis

(iii) Fuel cells

(iv) DSC

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Roll No. 1014

FIRST SEMESTER

B.Tech. (Group A)

END SEMESTER EXAMINATION

NOV.-DEC.-2011

EE-105 ELECTRICAL SCIENCES

Time: 3 Hours *Maximum Marks : 70*

Note : Question No. *ONE* is compulsory.
Answer any *FOUR* questions from the remaining.
Assume suitable missing data, if any.

1[a] Explain main features of dependent sources and independent sources.

[b] Show that Norton theorem and Thevenin's theorem are dual to each other.

[c] Show that for a parallel RLC circuit $f_0^2 = f_1 . f_2$, where f_0, f_1 and f_2 are frequencies at resonance and half power points.

[d] While measuring power in a 3 phase circuit by two wattmeter method one of the wattmeters indicates a negative reading explain the reasons.

[e] An induction motor of the same rating that of 3-ϕ transformer, draws more current at no load than a transformer. Explain with justification.

[f] Why is eddy current damping not provided in moving iron instruments?

[g] Explain the significance of BH curve.

7×2=14

2[a] Draw V-I characteristics of the following (i) Ideal voltage and current sources (ii) Ohmic and non-ohmic elements. 4

[b] The current in a 10 Henry inductor is shown in Fig.1. Sketch wave forms for the voltage v(t), the instantaneous power p(t) and the energy stored w(t) as a function of time. 10

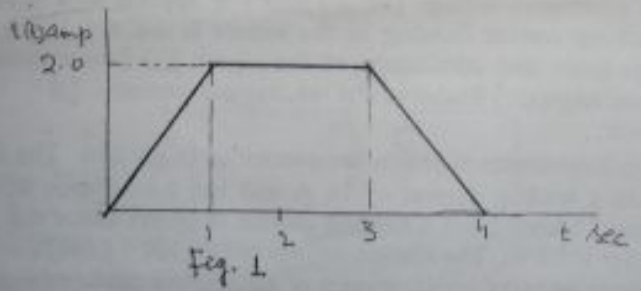

Fig. 1

3[a] Find currents I_1 and I_2 in the circuit shown in Fig.2 7

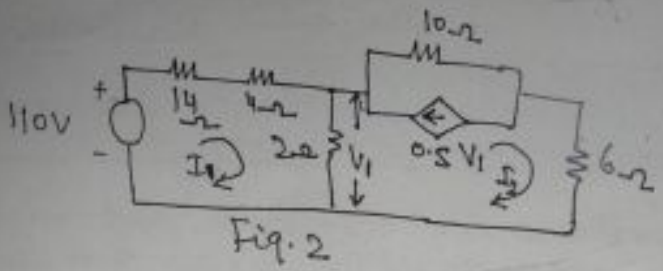

Fig. 2

[b] Obtain a Thevenin's equivalent at terminals a-b for the circuit shown in Fig.3 7

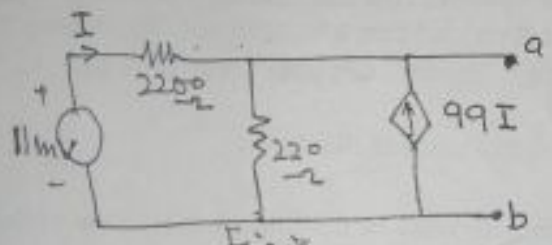

Fig. 3

4[a] An alternative voltage (80 + j 60) v is applied to a circuit and the resulting current flowing in the circuit is (-4 + j 10) A. Find (i) Impedance and admittance of the circuit (ii) Power consumed (iii) Phase angle (iv) Resistive and reactive components. (v) Apparent power. 7

[b] Two impedances z_1 and z_2 are connected in parallel. The first branch takes a leading current of 16 A and has a resistance of 6Ω, while second branch takes a lagging current at power factor 0.8. The total power is 5 kW. The applied voltage being (100 + j 200)V .
Determine : (i) Circuit constant of the network (ii) branch currents (iii) total current. 7

75.62.

6852
59.62

5[a] In a series RLC a circuit consisting of R = 2Ω, L = 1mH and = 0.4 μF. Find (i) resonance frequency

(ii) Half power frequencies

(iii) Quality factor

(iv) Bandwidth

(v) Amplitude of currents at w_0 w_1 and w_2 if applied voltage is 20sinωt

[b] Explain the principle of operation of 3-phase induction motor. 10 4

6[a] Calculate the power supplied to the 10Ω resistor in the ideal transformer shown in Fig.4 10

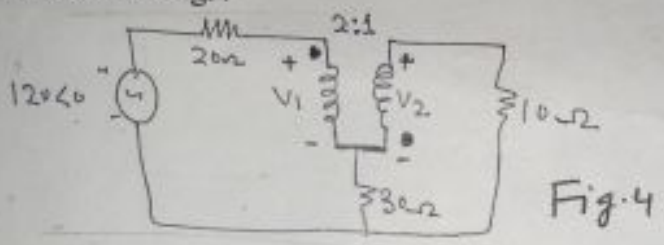

Fig.4

[b] Compare electrical and magnetic quantities. 4

7 Efficiency of 400/200V, 200 kVA single phase transformer is 98.5% at full load at 0.8 pf lagging At half load and at 0.8 pf lagging the efficiency is 97.5% calculate the values of coreloss and copper loss at full load. 7

[b] Consider the circuit in Fig.5 determine coupling coefficient. Calculate the energy stored in the coupled inductors at time t = 1 sec if V = 60 cot (4t + 30°) volt 7

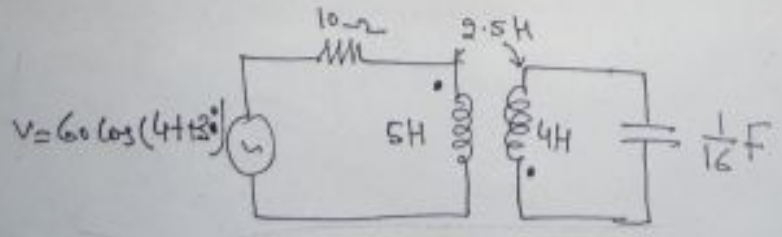

Fig.5

8[a] A star connected 3-phse load has a resistance of 8Ω and inductance 0.0191H in each phase. It is fed from 400V, 50 Hz, 3-phase balanced supply. Determine

i. Line currents in all phases
ii. Power factor
iii. Power
iv. Apparent power
v. If power is measured by two wattmeter method. Determine W_1 and W_2
vi. Draw neatly phasor diagram. **10**

[b] Discuss advantages of digital instruments. **4**

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Roll No. 1014

FIRST SEMESTER **B.Tech. (Group A)**

END SEMESTER EXAMINATION NOV.-DEC.-2011

IT-106 FUNDAMENTALS OF INFORMATION TECHNOLOGY

Time: 3 Hours ***Maximum Marks : 70***

Note : Answer any FIVE questions.
Assume suitable missing data, if any.

1[a] What are the different type of memory available in a computer system, explain. How are they organized in a hierarchy? 7

[b] Why are compression technique used in data communication? What is Run length Encoding technique for compression? Encode the following character sequence using run length encoding.
1111100000033557777 7

2[a] Explain the working of a S-R Flip Flop with logic gate diagram and truth table What is the advantage of JK-flip Flop over S-R flip flop? 7

[b] Explain the TCP/IP layered architecture briefly explaining the function of each layer. 7

3[a] Implement the following Boolean function using
(i) 8×1MUX
(ii) 16×1 MUX
$F(A,B,C,D) = \Sigma m(0,1,3,5,8,11,12,14,15)$ 7

[b] What are language translators? Differentiate between assembler, interpreter and compiler. 7

4[a] Explain each step with diagram starting from sampling to obtain pulse code modulated signal from analog message signal. 7

[b] What are web browser, web page, markup language and URL? Explain typical structure of an URL. 7

5[a] Show mathematically and diagrammatically the various wave components and power distribution in an amplitude modulated wave. 7

[b] Explain what are system and application software with suitable examples. 7

6[a] Define the terms channel, noise, bandwidth and modulation. Why is modulation required in a communication system? 7

[b] Minimize using K-map and then implement using NOR gates the following Boolean function

$$F(A, B, C, D) = \Sigma m\,(0,1,2,3,4,6,8,9) + d(10,11,13)$$

7

7[a] Why are cryptographic technique required for computer networks? Differentiate between public and private key cryptographic. Decrypt the following cipher encoded with ceaser cipher technique with key K =5

NSKTWRFYNTS YJHMSTQTLD

7

[b] Design context level data flow diagrams, level 0 and level 1 for a blood donation camp. 7

8 Write short notes on ***any two***

[a] Digital signature

[b] Instruction cycles

[c] Search engine

[d] FTP. 7×2