

BASIC ELECTRICAL ENGG.

(Theory – 4(a))

Full Marks : 40

Time : $1\frac{1}{2}$ hours

Answer any four questions including Q. Nos. 1 & 2

Figures in the right-hand margin indicate marks

1. Answer *all* questions : 2 × 5
 - (a) What is Fleming Right Hand Rule ?
 - (b) What is the function of super heater ?
 - (c) What do you mean by Teak factor ?
 - (d) What is KCL ?
 - (e) What do you mean by impedance of R-L series circuit ?
2. Answer any *three* : 5 × 3
 - (a) What do you mean by Faraday's laws of electromagnetic induction, explain.
 - (b) Write the principle of operation of a D.C. motor.
 - (c) What PMMC type instruments, explain.
 - (d) Derive R.M.S. value of alternating quantity.
3. State briefly about Nuclear power plant with necessary block diagram. $7\frac{1}{2}$
4. The details of electric loads in house are as follows :
 - (i) 3 nos. lamps of 60 W each working 5 hrs per day.
 - (ii) 2 nos. tubelight of 40 W each working 4 hrs per day.
 - (iii) 5 nos. fans of 80 W each working 10 hrs per day.
 - (iv) A 1 HP pump working 4 hrs per day.
 - (v) A electric heater of 1 kW working 4 hrs per day.

Determine the energy consumption and cost of energy at the rate of Rs. 2.50 per unit for the month of Nov, 2018. $7\frac{1}{2}$
5. A resistance of 25 Ω , inductance of 0.3 H and capacitance of 150 μF are connected in series and are fed by 230 V, 50 Hz supply. Determine current, X_L , X_C , Z, power factor and active power of the circuit. $7\frac{1}{2}$

BASIC ELECTRONICS ENGG.

(Theory – 4(b))

Full Marks : 40

Time : $1\frac{1}{2}$ hours

Answer any four questions including Q. Nos. 1 & 2

Figures in the right-hand margin indicate marks

1. Answer *all* the questions : 2 × 5
 - (a) What is PIV ?
 - (b) Define Ripple factor. What is its value for half wave rectifier ?
 - (c) What is demodulation ?
 - (d) What is electron emission ? Name the types of the emission.
 - (e) Define transistor biasing. What is the need of biasing ?
2. Answer any *three* : <http://www.sctevtonline.com> 5 × 3
 - (a) Explain the operation of full wave rectifier with its advantages and disadvantages.
 - (b) With proper diagram describe the operation of capacitor input filter.
 - (c) Write down the difference between intrinsic and extrinsic semiconductor.
 - (d) Discuss different types of modulation with proper waveforms.
3. What is multimeter ? Explain the multimeter as ammeter, voltmeter and ohmmeter. $7\frac{1}{2}$
4. With proper block diagram, explain the function of each block of CRO. $7\frac{1}{2}$
5. (a) Explain the operation of LED with its advantages. $3\frac{1}{2}$
(b) Classify solid according to electrical conductivity with respect to energy band diagram. 4

COMMUNICATIVE ENGLISH

(Theory : 1(a))

Full Marks : 80

Time : 3 hours

Answer all questions

Figures in the right-hand margin indicate marks

1. Read the following passage carefully and answer as per the instructions given below :

Dr. Jonas Salk had begun his medical research career studying immunology. In 1947, while at the University of Pittsburgh, he began his research on poliovirus. His research was greatly helped in 1949, when a method of growing poliovirus in cell culture, instead of having to use primarily monkeys for research, was discovered. Salk needed to find a way to process the virus so that they were less infectious, before using them in vaccine. In 1952, Salk was the first to develop a successful vaccine using a mixture of the three types of virus, growing monkey kidney cultures. He developed a process using formalin, a chemical that inactivated the whole virus.

What followed was massive testing of the vaccine in clinical trials in the United States and parts of Canada, begun in 1954. The scope of the trials was unprecedented in medical history. The result was dramatic. Cases of polio fell spectacularly in the vaccinated test groups. In 1955, the Government quickly granted permission for the vaccine to be distributed to the children of our country. But, there was a problem with original Salk vaccine. The vaccine actually induced 260 cases of poliomyelitis, including 10 deaths. The problem was traced to incomplete inactivation of some virus particles, which was soon corrected. Since then the vaccine has been highly effective, with a 70-90% protection rate. <http://www.sctevtonline.com>

In 1957, in an effort to improve upon the killed, Albert Bruce Sabin began testing a live, oral form of vaccine in which the infectious part of the virus was inactivated. The vaccine became available for use in 1963. The Salk vaccine is given in two intramuscular injections spaced one month apart and requires boosters every 05 years. Because of the way it is inactivated, the vaccine is safe for those with compromised immune system. The Sabin oral vaccine is given in three doses in the first two years of life, and a booster is given when the child starts school. Further boosters are not given unless the patient is exposed to polio or will be traveling to an endemic region.

(a) Answer the following briefly :

2 × 6

(i) What method did Jonas Salk use to develop polio vaccine ?

(ii) How did Salk develop a successful polio vaccine ?

(Turn Over)

- (iii) How was the first polio vaccine accepted ?
- (iv) What was the problem with original Salk vaccine ?
- (v) How was Salk vaccine given ?
- (vi) How was Sabin vaccine given ?

1 × 4

(b) Match A with B :

<u>A</u>	<u>B</u>
i. Compromised	a. Infected area
ii. Endemic region	b. Non-productive
iii. Immunity	c. Weakened
iv. Sterile	d. Ability of protection against diseases

1 × 2

(c) Give antonyms of the following :

- (i) Grow
- (ii) Activation

2

(d) Supply a suitable title to the passage.

2. Read the following :

Kashmiris had one advantage over many others in India, especially in the North. They have never had any 'purdah', or seclusion of women. Finding this custom prevailing in the Indian plains, when they came down, they partly adopted it in so far as their relations with other non-Kashmiris are concerned. "Purdah" was then considered a kind of social status in North India. But Kashmiris stuck to free social life of men and women which never encountered any resistance from the neighbourhood, where they stayed in North India. Every Kashmiri had a free entree into any Kashmiri house. In Kashmiri feasts and ceremonies men and women met together and sat together in British India. Of course, they did not have the freedom of modern west.

A. Make a note of the above passage.

5

B. Attempt a summary of the above passage basing upon the notes you have made.

5

C. Five meanings of ENCOUNTER is given in column A. Match the meaning with corresponding sentences given under B.

1 × 5

A (Meanings)

- (i) To express something unpleasant or difficult
- (ii) To meet somebody
- (iii) A specially one that is sudden and violent
- (iv) A sort of match against a particular player or team
- (v) An accident in which the criminal was shot

(Continued)

B (Sentences)

- ✓(a) The terrorist was shot dead in encounter.
(b) Three of them killed in the subsequent encounter with the police.
(c) She was beaten her opponents in all their previous encounters.
(d) I have never encountered such resistance before.
(e) She was the most remarkable women he had ever encountered.

3. Answer any *five* of the following : 2 × 5

- (i) What does it mean by "My education was left to the street" ?
(ii) What made red look older than he really was ?
(iii) Write down the characteristics of a good team player.
(iv) Was the Inchcape Rock dangerous ? Why ?
(v) Why did Sir Ralph curse himself ?
(vi) How does the poet value her friendship ?

4. Do as directed : 1 × 5

- (i) Sugar _____ sweet. (taste/tastes)
(ii) _____ I meet you in the evening, sir ? (can/could)
(iii) He left Cuttack in 2017. He _____ there for five years. (had stayed/stayed)
(iv) The musical qualities as well as the rythm of the poem _____ its main attraction. (is/are)
(v) He gifted me a toy. (change the voice)

5. Do as directed :

(a) Answer any *two* of the following : 4 × 2

- (i) Write a paragraph describing the Annual Sports Event of your institute (100 words).
(ii) You are the athletic secretary of your institute. Your institute is going to organize a three-days' workshop on Hockey at inter-polytechnic level. Draft a notice giving all details.
(iii) You suffered from fever for four days and did not take meal in hostel mess. Write an application to your hostel superintendent to exempt you from paying for those 04-days' mess charge.

- (iv) You ordered for 100 pairs of sports shoes with Daniel Distributors, phase-I, Main Market, Kolkata. The delivery date has already expired by 10 days and you received no response to your enquiry about the delay. You are a retail shop owner. Draft a letter of cancellation of the order.

(h) Read the following advertisement :

7

De'Souza Tyre and Tubes West-Market Complex Bhawani Patna Odisha	
No. AXX/09/2018	15th Dec, 2018
We are an emerging sector in Tyres and Tubes for all sorts of purpose. We need 02 junior engineers for our production unit. Qualification : Diploma in Mechanical Engg; Experience : Not a strict criteria (freshers with outstanding career are welcome), Age : Not more than 25 as on dt. 01.12.2018, Salary : Negotiable with free housing and fooding Apply within 10 days to the undersigned.	
Manager Training and Recruitment	

Draft a job application with reference to the above advertisement and enclose your C.V.

6. Answer any *three* of the following :

5 × 3

- (i) Discuss the various factors engaged in the process of communication with a suitable diagram.
- (ii) What does it mean by facial expression ? Why it is important ? Discuss with minimum 05 examples.
- (iii) How up-ward and down-ward communication take place in an organisation ? Write their merits and demerits.

(iv) Answer any *two* of the following :

$2\frac{1}{2} \times 2$

- (a) Personal space
(b) Audience
(c) Audio-sign(s).

COMPUTER APPLICATION

(Theory – 1(b))

Full Marks : 80

Time : 3 hours

Answer any five questions including Q. Nos. 1 & 2

Figures in the right-hand margin indicate marks

1. Answer the following questions : 2 × 10

- (a) What are the principal components used in 2nd and 3rd generation computer ?
- (b) Define GUI.
- (c) Define FTP.
- (d) What is internet ?
- (e) What is the difference between file and folder ?
- (f) Define flowchart.
- (g) What are the various data types available in 'C' language ?
- (h) Write down the equivalent C expression for $b^2 - 4ac$.
- (i) Define array.
- (j) What is ALU ?

2. Answer any five questions : 6 × 5

- (a) Give a brief idea about the classification of computers.
- (b) Define compiler. How it is different from Interpreter ?
- (c) Explain about different types of file access method.
- (d) Discuss about different functions of operating system.
- (e) What is E-mail ? Explain the features of E-mail.
- (f) What is loop ? Explain different types of loops in 'C' with syntax.
- (g) Draw a flowchart to find out the largest number among three numbers.

3. Define memory. Give the characteristics of different types of memory of a computer system. 10

4. Draw a flowchart and write a program in 'C' to find out factorial of a given number 'n'. 10

(Turn Over)

5. What do you mean by network topology ? What are the major types of network topologies ? Explain each type in brief. 10
6. What is virus ? How does virus spread and what are the symptoms of virus attack ? 10
7. Write short notes on (any two) : 5 × 2
 - (i) Software
 - (ii) WINDOWS Operating System
 - (iii) Arithmetic relational operators in 'C'.

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ENGG. CHEMISTRY

(Theory – 2(b))

Full Marks : 80

Time : 3 hours

Answer any five questions including Q. Nos. 1 & 2

Figures in the right-hand margin indicate marks

1. Answer all questions : 2 × 10

- (a) What are flux and slag ?
- (b) Define an electrolyte ? Give two examples of strong electrolytes ?
- (c) Calculate the pH of 0.01 M H_2SO_4 ?
- (d) What are pesticides ? Classify these ?
- (e) Define isotone ? Give example.
- (f) Define primary and secondary fuels.
- (g) What are aromatic compounds ? Give examples.
- (h) What are acid radicals ? Give examples of two divalent monoatomic acid radicals ?
- (i) Write the disadvantages of lime soda process.
- (j) Calculate equivalent weight of Na_2SO_4 and acetic acid ?

2. Answer any six questions : 5 × 6

- (a) What are isotopes and isobars ? Write their significant features.
- (b) Explain the formation of NH_4^+ ion.
- (c) What is vulcanisation ? Write its advantages.
- (d) Give comparison between thermoplastic and thermosetting polymers ?
- (e) Explain the process of leaching.
- (f) Write the IUPAC names and structures of following compounds :
 - (i) $CH_3CH(C_2H_5)CH_2CH(C_2H_5)CH_3$
 - (ii) $CH_2CHCH_2CHCH_2$
 - (iii) Isoprene
 - (iv) Neo-heptane
 - (v) 3, 4 - diethyl -2, 5 - dimethyl hexane.

(Turn Over)

- (g) Write the characteristics of electrovalent compounds.
- (h) What are bio-fertilizers ? Write uses of various such fertilizers.
- (i) If 13.8 gms of K_2CO_3 is present in one litre of its solution, then calculate the normality and pH of the solution ?
3. State and explain Faradays 1st and 2nd Law of electrolysis ? If the atomic weight of CU is 63, then calculate the amount of copper deposited from $CuSO_4$ solution by the passage of 0.5 ampere of for 1.5 hours. $3\frac{1}{2} + 3\frac{1}{2} + 3$
4. (a) How can you regenerate the exhausted ion-exchange resins ? 5
(b) Write the principles of Bohr-Bury Scheme ? 5
5. (a) What is corrosion ? Explain, Waterline corrosion with the mechanism. 1 + 5
(b) Write the limitations of Arrhenius theory for acid and base ? 4
6. (a) Explain the process of electro-refining. http://www.sctevtonline.com 5
(b) What are alloys ? Write the composition and uses of Alnico and Duralumin. 1 + 2 + 2
7. (a) 20 gms of caustic soda is dissolved in water to prepare 0.5 litre of its solution, having density 1.02 gm/cc. Calculate the normality, molarity and molality of the solution ? 5
(b) Write the failure of Rutherford's atomic model ? 5

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ENGINEERING MATHEMATICS - I

(Theory — 3)

Full Marks : 80

Time : 3 hours

Answer any four questions including Q. Nos. 1 & 2

Figures in the right-hand margin indicate marks

GROUP — A

1. Answer all :

2 × 10

(a) Find the value of

$$\frac{\cos 15^\circ + \sin 15^\circ}{\cos 15^\circ - \sin 15^\circ}$$

(b) Find the minimum value of

$$5\sin x + 12\cos x$$

(c) Solve by Crammer's rule

$$\begin{aligned}x + y &= 2 \\2x - y &= 1\end{aligned}$$

(d) Find the ratio in which the line segment joining $(-2, -3)$ and $(4, 5)$ is divided by the X -axis.

(e) Find the centre and radius of the circle

$$2x^2 + 2y^2 - 4x + 6y + 2 = 0$$

$$(f) \text{ If } A = \begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix} \text{ and } B = \begin{pmatrix} 4 & 1 \\ 5 & 2 \end{pmatrix}$$

(g) Find the image of the point $(-2, 3, 1)$ with respect to xy -plane.(h) Find the distance of the point $P(3, 4, 5)$ from X -axis.(i) Find length of perpendicular of the point $(1, -1, -1)$ from the plane

$$2x + y + 2z + 4 = 0.$$

(j) Find equation of the sphere which has centre $(1, 2, 3)$ and passes through $(0, 0, 0)$.

(Turn Over)

GROUP – B

2. Answer any six questions :

5 × 6

(a) Prove that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$

(b) Find adjoint of the matrix

$$\begin{pmatrix} 2 & 3 \\ 4 & 2 \end{pmatrix}$$

(c) If $A + B + C = \pi$ then prove that

$$\sin 2A + \sin 2B + \sin 2C = 4 \sin A \cdot \sin B \cdot \sin C$$

(d) Find equation of the line which passes through the point (1, 2) and perpendicular to the line $4x + 3y + 5 = 0$.

(e) Find equation of the circle which passes through (0, 0) and has intercepts a and b on X -axis and Y -axis respectively.

(f) Find equation of the plane bisecting the line segment joining the points $(-1, 4, 3)$ and $(7, -2, 1)$ at right angle.

(g) If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi/2$ then prove that $xy + yz + zx = 1$.

(h) If $\frac{1}{a+c} + \frac{1}{b+c} = \frac{3}{a+b+c}$ prove that $\angle C = 60^\circ$

GROUP – C

Answer any three questions :

10 × 3

3. (a) Find angle between two planes

$$\begin{aligned} x + 2y + 2z - 7 &= 0 \\ 2x - y + z - 6 &= 0 \end{aligned}$$

(b) Find equation of the sphere which passes through (0, 0, 0), (a, 0, 0), (0, b, 0) and (0, 0, c).

4. (a) Find inverse of the matrix

$$\begin{pmatrix} 4 & 6 \\ 2 & 4 \end{pmatrix}$$

- (b) Find equation of the line passing through intersection of $2x - y - 1 = 0$ and $3x + 4y + 6 = 0$ and passes through $(0, 0)$.

5. (a) Prove that

$$2\cos\frac{\pi}{16} = \sqrt{2 + \sqrt{2 + \sqrt{2}}}$$

- (b) Solve by Crammer's rule

$$2x + y + 2z = 2$$

$$3x + 2y + z = 2$$

$$-x + y + 3z = 6$$

6. (a) Find the foot of perpendicular drawn from the point $(0, 0, 0)$ on the plane

$$2x + y + z - 3 = 0$$

- (b) Prove that

$$\sin^2(\sin^{-1}x + \sin^{-1}y + \sin^{-1}z) = \cos^2(\cos^{-1}x + \cos^{-1}y + \cos^{-1}z)$$

7. (a) Find distance of the point $(1, 2)$ from the $x + 2y + 1 = 0$ measured parallel to the line

$$3x - y + 1 = 0.$$

- (b) Find equation of the circle which has centre on X -axis and the circle passes through $(0, 0)$ and $(4, 2)$.

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ENGINEERING PHYSICS

(Theory – 2(a))

Full Marks : 80

Time : 3 hours

Answer any five questions including Q. Nos. 1 & 2

Figures in the right-hand margin indicate marks

1. Answer all questions : 2 × 10

- (a) What are the basic units in SI system.
- (b) State triangle law of vector addition.
- (c) What is relation between linear velocity and angular velocity ?
- (d) Define Work and write its SI unit.
- (e) Define universal gravitational constant(G).
- (f) Define transverse wave.
- (g) Define Latent Heat.
- (h) State the laws of refraction
- (i) Define unit charge.
- (j) State Lenz's law.

2. Answer any six questions : 5 × 6

- (a) State the principle of homogeneity and check the correctness of the formula
$$v^2 - u^2 = 4as.$$
- (b) A body projected vertically upward reaches height of 89 m. Calculate its initial velocity.
- (c) Distinguish between mass and weight.
- (d) Define ultrasonics and write its properties.
- (e) State first law of thermodynamics.
- (f) Define critical angle and total internal reflection.
- (g) State Coulomb's law of magnetism and define unit pole.
- (h) Write the properties and application of LASER.

(Turn Over)

3. Derive expression for Time of flight, Maximum height and Horizontal Range for a projectile fired at an angle θ . 10
4. ✓ State the laws of limiting friction and mention different methods to reduce friction. 10
5. ✓ (a) State Kepler's laws of planetary motion.
(b) A body weights 40 kg wt on the surface of earth. What will be its weight on the surface of Mass of radius $\frac{1}{3}$ and mass $\frac{1}{12}$ of that of earth. 6 + 4
6. Calculate the quantity of heat required to raise the temperature of 10 gm of ice at -10°C to water at 60°C . 10
7. ✓ State Faraday's laws of electromagnetic induction and compare between Fleming's Left Hand Rule and Right Hand Rule. 6 + 4
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