



Knowledge Resource & Relay Centre (KRRC)

AIKTC/KRRC/SoET/ACKN/QUES/2018-19/

Date: _____

School: SoET-CBSGS

Branch: ALL BRANCHES

SEM: II

To,
 Exam Controller,
 AIKTC, New Panvel.

Dear Sir/Madam.

Received with thanks the following [✓]Semester/[✓]Unit Test-I/Unit Test-II (Reg./ATKT) question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Applied Mathematics- II	FEC201		✓	02
2	Applied Physics- II	FEC202		✓	02
3	Applied Chemistry- II	FEC203			
4	Engineering Drawing	FEC204			
5	Structured Programming Approach	FEC205		✓	02
6	Comm. Skills- II	FEC206			

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
 Librarian, AIKTC



Duration – 3 Hours

Total Marks: 80

- (1) N.B.:- Question no 1 is compulsory.
(2) Attempt any THREE questions out of remaining FIVE questions.
(3) Figures to the right indicate full marks.

Q.1.a) Solve $\left[y \left(1 + \frac{1}{x} \right) + \cos y \right] dx + (x + \log x - x \sin y) dy = 0$ (3)

b) Find the particular integral of $(D^2 - 2D + 1)y = xe^x \sin x$ (3)

c) Evaluate $I = \int_0^{\pi/4} (1 + \cos 4\theta)^5 d\theta$ (3)

d) Prove that $E \nabla = \nabla E$ (3)

e) Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x dx dy dz$ (4)

f) Using Euler's method, find the approximate value of y , where $\frac{dy}{dx} = \frac{y-x}{\sqrt{xy}}$ (4)
with $y(1) = 2$ when $x = 1.5$ in five steps taking $h = 0.1$

Q.2 a) Solve $dr + (2r \cot \theta + \sin 2\theta)d\theta = 0$ (6)

b) Evaluate $\int_0^a \frac{e^{-x}}{x} (1 - e^{-ax}) dx$ ($a > -1$) (6)

c) Change to polar and evaluate $I = \int_0^a \frac{\sqrt{a^2-x^2}}{\sqrt{ax-x^2}} \frac{dx dy}{\sqrt{(a^2-x^2-y^2)}}$ (8)

Q.3 a) Evaluate $I = \int_0^1 x^4 \cos^{-1} x dx$ (6)

b) Evaluate $\iiint \frac{dx dy dz}{x^2 + y^2 + z^2}$ throughout the volume of the sphere $x^2 + y^2 + z^2 = a^2$ (6)

c) Apply method of variation of parameter to solve $\frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + y = e^{-x} \log x$ (8)

Q. 4 a) Find the mass of a plate in the form of a cardioid $r = a(1 - \cos \theta)$, if the density at any point of the plate varies as its distance from the pole. (6)

b) Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = 2xe^{3x} + 3e^x \cos 2x$ (6)

c) Using fourth order Runge-Kutta method, solve numerically, the differential equation $\frac{dy}{dx} = xy$ with the given condition $y(1) = 2$, find y at $x=1.2, 1.4$ (8)

Q. 5 a) Evaluate $\iint xy \, dx \, dy$ over the region bounded by $x^2 + y^2 - 2x = 0$, $y^2 = 2x$ and $y = x$ (6)

b) A resistance of $100 \, \Omega$ and inductance of $0.5 \, \text{H}$ are connected in series with a battery of $20 \, \text{V}$. Find the current at any instant if the relation between $L, R,$

$$E \text{ is } L \frac{di}{dt} + Ri = E$$

c) Evaluate $\int_0^1 \frac{dx}{1+x}$ by using (i) Trapezoidal Rule, (ii) Simpson's $(1/3)^{\text{rd}}$ Rule and (iii) Simpson's $(3/8)^{\text{th}}$ Rule. Compare the result with exact solution. (8)

Q. 6 a) Solve $(3x+2)^2 \frac{d^2y}{dx^2} + 3(3x+2) \frac{dy}{dx} - 36y = 3x^2 + 4x + 1$

b) Show that the length of the parabola $y^2 = 4ax$ from the vertex to the end of the latus rectum is $a\left[\sqrt{2} + \log\left(1 + \sqrt{2}\right)\right]$

c) Find the volume bounded by the paraboloid $x^2 + y^2 = az$ and the cylinder $x^2 + y^2 = a^2$

Time: 2 Hrs.

Marks : 60

N.B. 1) Question No 1 is compulsory.

2) Attempt any three questions from the remaining questions.

3) Assume suitable data and symbols if required.

4) Figures on the right indicate full marks.

- Q.1 Attempt any FIVE. (15)
- What is Rayleigh's criterion of resolution? Define resolving power of grating.
 - A superconductor has a critical temperature 3.7°K . At 0°K the critical magnetic field is 0.0306 Tesla . What is the critical magnetic field at temperature 2.0°K ?
 - An electron is bound in a one dimensional potential well of width 2 \AA but of infinite height. Find its energy values in the ground state and first excited state?
 - What are the advantages of use of optical fibre in communication system?
 - Explain measurement of frequency of AC signal using CRO.
 - What is acronym of 'LASER'? How are they different than ordinary rays?
 - What do you understand by a thin film? Comment on the colours in thin film in sunlight.
- Q.2 a) Prove that the diameter of n^{th} dark ring is proportional to square root of natural number in case of reflected system. What will be the order of the dark ring which will have double the diameter of the 40^{th} dark ring? (8)
- b) A multimode step index optical fibre has core radius of $3\text{ }\mu\text{m}$ and its core refractive index is 1.45. Calculate i) refractive index of cladding ii) acceptance angle iii) the number of modes propagating through fibre when wavelength of light is $1\text{ }\mu\text{m}$. (7)
(critical angle is 87°)
- Q.3 a) With neat energy level diagram explain principle, construction & working of He-Ne laser? (8)
- b) Derive the condition for a thin transparent film of constant thickness to appear bright and dark when viewed in reflected light. (7)
- Q.4 a) What is the highest order spectrum which can be seen with monochromatic light of wavelength 6000 \AA by means of diffraction grating with 5000 lines/cm . (5)
- b) Derive Schrodinger's time dependent wave equation for matter waves. (5)
- c) Distinguish between Type I and Type II superconductors? (5)
- Q.5 a) Show that electron cannot exist inside the nucleus using Heisenberg's uncertainty principle. (5)
- b) A plane transmission grating having 6000 lines/cm is used to obtain a spectrum of light from a sodium lamp in the second order. Calculate the angular separation between the two sodium lines whose wavelengths are 5890 \AA & 5896 \AA ? (5)
- c) With neat diagram explain construction & working of Scanning Electron Microscope. (5)
- Q.6 a) What are carbon nano tubes & what are their properties? (5)
- b) Derive Bethe's law for electron refraction? (5)
- c) The electron which is at rest is accelerated through a potential difference of 200V . Calculate i) the velocity of electron ii) De-Broglie wavelength (5)

Time: 3 Hours

Marks: 80

N.B

- (1) Question no. 1 is compulsory.
- (2) Attempt any 3 from the remaining questions.
- (3) Assume suitable data if necessary.
- (4) Figures to right indicate full marks.

Q.1 a. Attempt multiple choice questions. 10

- i. Which of the following is valid variable name?
(a) case (b) int_rate2 (c) 2sum (d) for
- ii. The operator -- is a
(a) Unary operator (b) Binary operator (c) Ternary operator (d) Conditional operator
- iii. Control automatically passes to the beginning of loop by using
(a) break statement (b) goto statement (c) continue statement (d) none of these
- iv. '&' is a _____ operator.
(a) Unary operator (b) Value operator (c) Address operator (d) none of these
- v. do.....while is _____ control loop.
(a) exit (b) entry (c) count (d) all of these
- vi. Which is the correct way to declare a pointer?
(a) int *ptr (b) int ptr* (c) * int ptr (d) none of these
- vii. Which of the following belongs to derived data type.
(a) structures (b) union (c) pointers (d) all of the above
- viii. Which function used to write a character to a file
(a) fputc() (b) fgetc() (c) fputs() (d) fwrite()
- ix. Each case statement in switch () is separated by
(a) break (b) continue (c) goto (d) none of these
- x. Which of the following #define statement is valid?
(a) #define x=10 (b) #define x 10; (c) #define x 10 (d) # Define x 10

b. a. Convert the mathematical expression into equivalent C expression 03

i.
$$a = \frac{xy + z\left(\frac{x}{y}\right) + zy}{x + y + z}$$

ii.
$$r = \frac{2v + 6.22(c + d)}{g + v} + \frac{3}{c/d}$$

iii.
$$a = x^{y^z}$$
 [hint: use function from math library]

- c. If x, y and z are int variable then evaluate the following expression and give final value of x, y, z and p. 02
 $x = 10, y = 6, z = 8$
- i. $p = x-- + y-- + z / (x * x)$
 - ii. $p = --x + ++y * z--;$
- d. Compare structure and union with proper example. 02
 e. Explain pointers with example. How array is related with pointers? 03
- Q.2**
- a. What is function? What do mean by calling function and called function? What are function parameters? Using return statement can we return multiple values to calling function? If no then what solution is available? Explain with example. 12
 - b. Explain break and continue statements with suitable example. 08
- Q.3**
- a. WAP to sort the array in ascending order. 10
 - b. WAP to accept a string and count no. of vowels and consonants, spaces, digits and special characters in it. 06
 - c. WAP to find maximum of three numbers using conditional operator. 04
- Q.4**
- a. Create a structure Patient having ID, patient_name and disease_name as data members. WAP to read details of 10 patients and print details of those patients having 'diabetes'. 12
 - b. What is a file? What are different types of files? Explain the following file handling functions in c. 08
 i) fopen () ii) fprintf () iii) fscanf () iv) fgets() v) fputs() vi) fclose()
- Q.5**
- a. WAP to check whether entered matrix is symmetric or not. 10
 - b. Explain difference between auto and static storage class with suitable example. 05
 - c. WAP to print a pattern 05
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- Q.6**
- a. What is recursion? How it is different from iteration? WAP to compute factorial of a number using recursion. 12
  - b. WAP to print Fibonacci series upto n. [Note: n entered by user, use iterative stmt] 08