RATHI CLASSES
New mantra for Success

आजीवनम् ज्ञानवर्धनम्

GSMT-4/CPT-4

General Aptitude-1 and Engineering Mathematics-1

(Electronics & Electrical Engineering)

Duration ~ 1:00 Hour   **Maximum Marks ~ 50**

Read the following instructions carefully

1. This question paper contains 30 objective types questions carrying 50 marks. Q.1 to Q.10 (10 Questions) carry **ONE MARK** and Q.11 to Q.30 (20 Questions) and will carry **TWO MARKS** each.

2. Attempt all the questions.

3. Questions must be answered on **Objective Response Sheet (ORS)** by marking (A, B, C, D) using **Blue or Black ball pen** against the question number on the left hand side of **(ORS).** Each question has only one correct answer.

4. For **1 mark** multiple-choice questions, **1/3 marks** will be deducted for a wrong answer. Likewise, for **2 marks** multiple-choice questions, **2/3 marks** will be deducted for a wrong answer.

   There is NO negative marking for numerical answer type questions.

5. Write your registration number, your name and name of the examination centre at the specified locations on the right half of the **ORS**.

6. Calculator is allowed in the examinatinon hall.

7. Charts, graph sheets or tables are NOT allowed in the examination hall.

8. Rough work can be done on the question paper itself. Additionally blank pages are given at the end of the question paper for rough work.

9. This question paper contains 12 printed pages including 3 pages for Rough Work. Please check all pages and report, if there is any discrepancy.

Q.1 LEVITY : GRAVITY

(a) Consecration : Descretion

(b) Zenith : Nadir

(c) Cocophony : Euphony

(d) Impropriety : Property

Q.2 Choose the word from the option given below that is most nearly opposite in meaning to the given word : underpining

(a) Set of idea　　　　　(b) Set of motive

(c) Set of devices　　　(d) None

Q.3 Choose the most appropriate word from the options given below to complete the following sentence:

The thieves are now making _____ the London Bridge.

(a) Off　　　　　　　　(b) For

(c) Out　　　　　　　　(d) To

Q.4 A fraction is such that the numerator is five less than the denominator, Also four times the numerator is one more than the denominator. Find the fraction's multiple that make it integral with minimum value _____.

Q.5 If x varies directly with 'y'; find which of the following varies directly with $x^3 - y^3$

(a) $x^3 + y^3$ only　　　　(b) $x^6 - y^6$ only

(c) $x^2 - y^2$ only　　　　(d) B and C only

Q.6 How many numbers can be find between two number A = 10 and B = $9.\overline{9}$ _____.

Q.7 The number of co-primes to a number N = 48, That are less than N

(a) 16　　　　　　　　(b) 32

(c) 24　　　　　　　　(d) 8

Q.8 Let number x + y + z = 0 and $xyz = \dfrac{1}{3}$ then find the value of $x^3 + y^3 + z^3 =$ _____.

Q.9 Let w, x, y and z be four natural numbers such that their sum is 8m + 10, where m is a natural number. For given m which of the following is necessarily true?

(a) The maximum possible value of $w^2 + x^2 + y^2 + z^2$ is $6 m^2 + 40 m + 26$

(b) The maximum possible value of $w^2 + x^2 + y^2 + z^2$ is $16 m^2 + 40 m + 28$

(c) The minimum possible value of $w^2 + x^2 + y^2 + z^2$ is $16 m^2 + 40 m + 28$

(d) The minimum possible value of $w^2 + x^2 + y^2 + z^2$ is $16 m^2 + 40 m + 26$

Q.10 The geomatric mean of the number $(24)_6$ and $(34)_7$ is $(24)_n$ the value of n is _____.

Q.11 **Direction for Question:** For the word given on the top of the table, match the dictionary definitions given in the left-hand column (A, B, C, D) with their corresponding usage given in the right-hand column (E, F, G, H). Out of the four numbered choices given in the boxes below the table, identify the one that has all definition and usages correctly matched.

MASS

A.	The Eucharist, especially in the Roman Chatholic Church	E.	During peak traffic hours, the entire city seems to be just a mass of humanity
B.	A dense arregation of object	F.	The mass conduct at the Church was good for the salvation of the soul.
C.	The ordinary people, the majority	G.	Science students must know that mass and weight are entirely different.
D.	The quantity of material that something contains	H.	The mass are bothered only about the problems of day-to-day living and therefore, have no time for politics or sports.

(a)

A	H
B	G
C	F
D	E

(b)

A	G
B	H
C	E
D	F

A	F
B	E
C	H
D	G

(c)

A	E
B	F
C	H
D	G

(d)

Q.12 If sonia wants to dilute her drink to the one third of strength of its initial state, suppose the initial volume of drink is 16 unit. She takes 3.842 unit of drink out and put same ammount of water "water unit" in the drink find number of operation she has to do _____.

Q.13 Let three people A, B, and C with respective speed of 32, 16, 8 m/sec be running arround a circular track of radius, 700/11 starting at same point at same time. The time taken by them to meet for the first timer ever _____.

Q.14 An anti-aircraft Gun Akash can takes a maximum of 4 shots at an enemy plane moving away from it. The possibilities of hitting the plane at 1st, 2nd, 3rd and 4^{rth} shots are 0.4, 0.2, 0.22, 0.1 respectively. Find the probability that the gun hits the enemy plane _____.

Q.15 Let $\sqrt{x+4} + \sqrt{x+8} = 7$, then the value of 'x' is _____.

Q.16 At what value of x, f(x) = $|2x - 7| - 8$ is minimum _____.

Q.17 The multi-level hierachical pie chart shows the population of animals in a reserve forest. The correct conclusion from these information are:
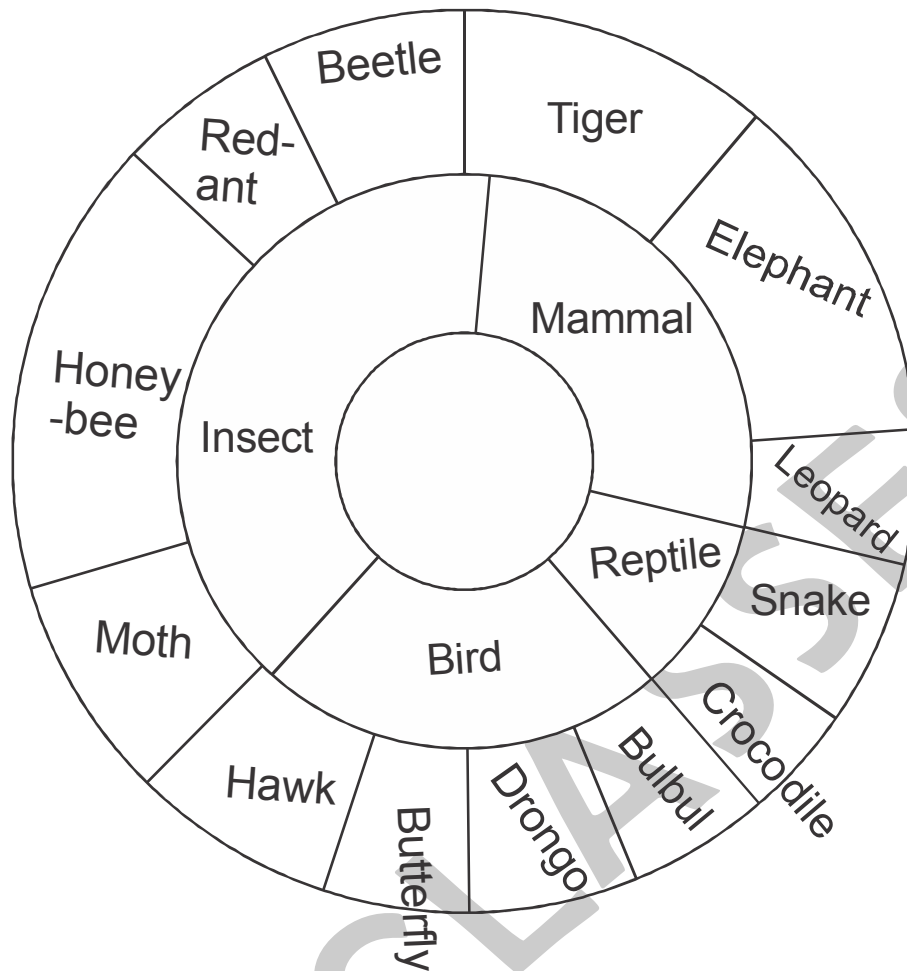
(1) Butterflies are birds

(2) There are more tigers in this forest than red ants.

(3) All reptiles in this forest are other snakes or crocodiles.

(4) Elephants are the largest mammals in this forest

(a) (1) and (2) only

(b) (1), (2), (3) and (4) only

(c) (1), (3), and (4) only

(d) (1), (2) and (3) only

Q.18 Which of the following matrix is row echelon form?

(a) $\begin{bmatrix} 1 & 0 & -1 & 2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$
(b) $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 0 & -1 \\ 0 & 1 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & -1 & 3 \\ 0 & 0 & -1 & 4 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

(d) $\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 2 \end{bmatrix}$

Q.19 If $f(x) = \begin{bmatrix} {}^xC_0 & {}^xC_1 & {}^{x+1}C_1 \\ 2^xC_1 & 2^xC_2 & 2^{(x+1)}C_2 \\ 6^xC_2 & 6^xC_3 & 6^{(x+1)}C_3 \end{bmatrix}$, then f(200) is

(a) 200   (b) –200

(c) 0   (d) –2001

Q.20 Which of the following is the characteristic equation of

$\begin{pmatrix} a & 0 & 0 & 0 \\ 0 & a & 0 & 0 \\ 0 & 0 & a & 0 \\ 0 & 0 & 0 & a \end{pmatrix}$?

(a) $\sum_{k=1}^{4}(-1)^{k.4}\,C_k \cdot a^{k-4} \cdot \lambda^k = 0$

(b) $\sum_{k=0}^{4}{}^4C_k \cdot a^{k-4} \cdot \lambda^k = 0$

(c) $\sum_{k=1}^{4}(-1)^k \cdot {}^4C_k \cdot a^{4-k} \cdot \lambda^k = 0$

(d) $\sum_{k=0}^{4}(-1)^k \cdot {}^4C_k \cdot a^{4-k} \cdot \lambda^k = 0$

Q.21 Evaluate $\int_{x=0}^{1}\int_{y=x^2}^{x}\dfrac{x}{y}e^{\frac{x^2}{y}}\,dy\,dx$ _____.

Q.22 Find the volume under the surface x + 2y + z = 4 and above the circle $x^2 + y^2 = 4$ in the xy-plane.
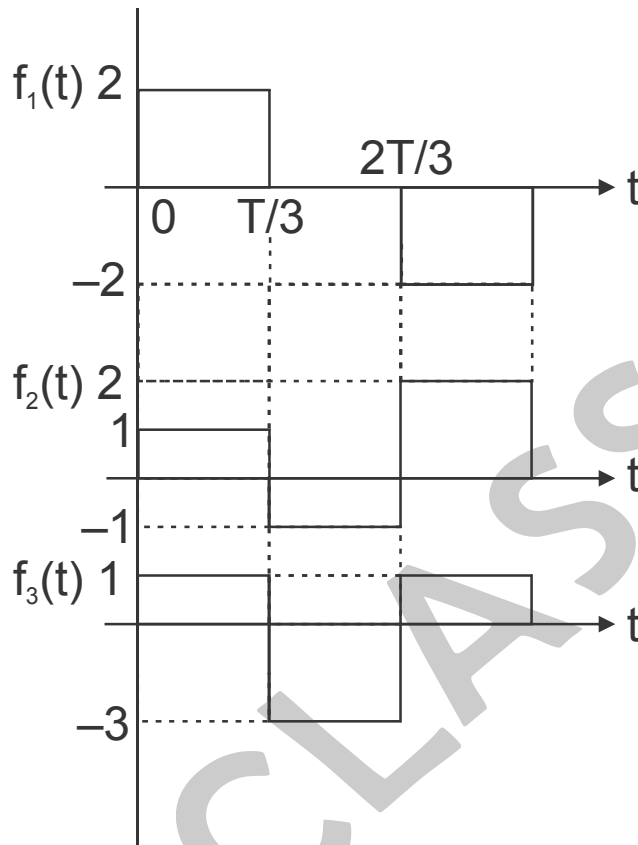
(a) 4π (b) 8π

(c) 32π (d) 16π

Q.23 Three function $f_1(t)$, $f_2(t)$ and $f_3(t)$ which are zero outside the interval [0, T], are shown in the figure. Which of the following statement is correct?

(a) $f_1(t)$ and $f_2(t)$ are orthogonal

(b) $f_1(t)$ and $f_3(t)$ are orthogonal

(c) $f_2(t)$ and $f_3(t)$ are orthogonal

(d) $f_1(t)$ and $f_2(t)$ are orthonormal

Q.24 Solve the equation $y'' + 4y' + 4y = x^3 e^{2x}$, find the value of coefficient of $x^3 e^{2x}$ in the solution _____.

Q.25 Consider the differential equation

$$\frac{d^2 y(t)}{dt^2} + 2\frac{dy(t)}{dt} + y(t) = \delta(t) \text{ with}$$

$$y(t)\Big|_{t=0^-} = -2 \text{ and } \frac{dy}{dt}\Big|_{r=0^-} = 0$$

The numerical value of $\dfrac{dy}{dt}\Big|_{t=0^+}$ is

(a) −2

(b) −1

(c) 0

(d) 1

Q.26 Evaluate $\int_c f(z)\,dz$ where $f(z) = z^2$ and c is the straight line joining z = 0 and z = 4 + i.

(a) $\dfrac{60 + 47i}{3}$

(b) $\dfrac{52 + 47i}{4}$

(c) $\dfrac{60 + 47i}{4}$

(d) $\dfrac{52 + 47i}{3}$

Q.27 Expension of f(z) where $f(z) = \dfrac{z^2 - 1}{(z+1)(z+4)}; 2 \le |z| \le 3$, as Laurent's series.

(a) $1 - \dfrac{5}{4}\left[1 - \dfrac{z}{4} + \dfrac{z^2}{16} - \ldots\right]$

(b) $1 - \dfrac{1}{4}\left[1 - \dfrac{z}{4} + \dfrac{z^2}{16} - \ldots\right]$

(c) $1 + \dfrac{1}{4}\left[1 + \dfrac{z}{4} - \dfrac{z^2}{16} + \ldots\right]$

(d) $1 - \dfrac{5}{4}\left[1 + \dfrac{z}{4} - \dfrac{z^2}{16} + \ldots\right]$

Consider the given data for the Question Number Twenty Eight

	Mean	S.D
x	20	5
y	80	10

The correlation coefficient between x and y = 0.6.

Q.28 The regression line of x on y of the above data is _____.

(a) x = –0.7y – 8

(b) x = 0.3y + 4

(c) x = 0.7y + 8

(d) x = 0.3 – 4

Q.29 The recursion relation to solve $x = e^{-x}$ using Newton-Raphson method is

(a) $X_{n+1} = e^{-X_n}$

(b) $X_{n+1} = X_n - e^{-X_n}$

(c) $X_{n+1} = (1 + x_n)\dfrac{e^{-x_n}}{1 + e^{-x_n}}$

(d) $X_{n+1} = \dfrac{z_n^2 - e^{-x_n}(1 + x_n) - 1}{x_n - e^{-x_n}}$

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Q.30 Match **List-I** and **List-II:**

	List-I (Solution of ordinary Differential Equation)	List-II
(P)	Taylor's series method	(a) $y_{n+1} = y_n + hf(x_n, y_n), n = 0, 1, 2...$
(Q)	Picard's method	(b) $y_1 = y_0 + \dfrac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$
(R)	Euler's method	(c) $y_n = y_0 + \int_{x_0}^{x} f(x, y_{n-1})dx, n = 1, 2, 3.......$
(S)	Modified Euler's Method	(d) $y_{n+1} = y_n + \dfrac{h}{1!}y_{n'} + \dfrac{h^2}{2!}y_{n'} + ...$
(T)	Runge – Kutta Method of order 4	(e) $y_{n+1}^{(k+1)} = y_n + \dfrac{h}{2}\left[f(x_n, y_n) + f(x_{n+1}, y_{n+1})\right]$

    (a) P – d, Q – c, R – a, S – e, T – b
    (b) P – d, Q – c, R – b, S – e, T – a
    (c) P – d, Q – c, R – e, S – b, T – a
    (d) P – d, Q – a, R – c, S – e, T – b

(End of the Question Paper)

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(SPACE FOR ROUGH WORK)