Code No: R2021021 **R20** SET - 1

II B. Tech I Semester Regular/Supplementary Examinations, December-2023
MATHEMATICS-IV
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

UNIT-I

1 a) Prove that the function f(z) defined by 10M
$f(z)=\frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}, z\neq 0 \, and \, f(0)=0$ is continuous and the Cauchy-Riemann equations are satisfied at the origin, yet $f^1(0)$ does not exists.

b) Evaluate $\int_0^{1+i} z^2 dz$ along $y=x^2$. 4M

OR

2 a) Determine p such that function $f(z)=\frac{1}{2}\log(x^2+y^2)+i\tan^{-1}\left(\frac{px}{y}\right)$ be an analytic function. 7M

b) Evaluate $\oint_C \frac{dz}{z^2+9}$ around $C: |z-3i|=4$. 7M

UNIT-II

3 a) Expand $f(z)=\frac{1}{z^2-3z+2}$ in the region $|z|<1$. 7M

b) Expand $f(z)=\frac{1}{z^2-4z+3}$ in the region $1<|z|<3$. 7M

OR

4 Using complex variable technique show that $\int_0^{\pi}\frac{1}{(3+2\cos\theta)}d\theta=\frac{\pi}{\sqrt{5}}$. 14M

UNIT-III

5 a) Companies B_1, B_2, B_3 produce 30%, 45% and 25% of the cars respectively. It is known that 2%, 3% and 2% of the cars produced from B_1, B_2, B_3 are defective. 7M
(i) What is the probability that a car purchased is defective?
(ii) If a car purchased is found to be defective what is the probability that this car is produced by company B_3.

b) X is a normal variate with mean 30 and variance 25. Find the probabilities that 7M
(i) $26\leq X\leq 40$ (ii) $X\geq 45$.

OR

|'''|'|'|''||'''||||
~~~~~~~~~~~~~~~~~~~~~~~~~

6 a) Two cards are drawn at random from an ordinary deck of 52 cards. What is the probability of getting two aces if 7M
(i) the first card is replaced before the second card is drawn;
(ii) the first card is not replaced before the second card is drawn?

b) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and variance of the distribution. 7M

UNIT-IV

7 a) A random sample of 400 items is found to have a mean of 82 and standard deviation of 18. Find the maximum error of estimate at 95% confidence. Also construct a 99% confidence interval for the true mean. 7M

b) A population consists of 6 numbers 4,8,12,16,20 and 24. Consider all possible samples of size two which can be drawn *without replacement* from this population and hence find the mean and variance of the sampling distribution of means. 7M

OR

8 a) Define the following distributions and discuss their properties: 10M
(i) t - distribution
(ii) F-distribution and
(iii) Chi-square distribution

b) Define Point estimation and interval estimation. 4M

UNIT-V

9 a) If 6 out of 20 cigarette smokers randomly chosen preferred 'charminar' cigarettes, test the claim at 0.05 level of significance, that 20% of the smokers prefer 'charminar'. 7M

b) It is claimed that a random sample of 49 tires has a mean life of 15200 km which is drawn from a population whose mean is 15150 km and a standard deviation of 1200 km. Test the claim at the level of significance (i) 0.01 and (ii) 0.05. 7M

OR

10 The nicotine content in milligrams in two samples of tobacco were found to be as follows: 14M

Sample A	24	27	26	21	25	23	24	28	--
Sample B	27	30	28	31	22	26	27	32	36

Can it be said that two samples came from populations with equal Means.

Code No: R2021021 **R20** SET - 2

II B. Tech I Semester Regular/Supplementary Examinations, December-2023
MATHEMATICS-IV
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

UNIT-I

1 a) Show that the function $u = e^{-2xy}\sin(x^2 - y^2)$ is harmonic. Find the conjugate function *v* and express $u + iv$ as an analytic function of *z*. 7M

b) Evaluate $\int_C \frac{z^2 - z + 1}{z - 1} dz$, where C is the circle $|z| = 1$. 7M

OR

2 a) If *f(z)* is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$. 7M

b) Evaluate by using Cauchy's theorem $\int_C \frac{z^3 e^{-z}}{(z-1)^3} dz$ where C is $|z - 1| = \frac{1}{2}$. 7M

UNIT-II

3 a) Expand by Taylor's series $\log(1 + z)$ about $= 0$. 7M

b) Expand $f(z) = \frac{(z-2)(z+2)}{(z+1)(z+4)}$ in the region $1 < |z| < 4$. 7M

OR

4 By integrating around a unit circle, evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4\cos\theta} d\theta$. 14M

UNIT-III

5 a) A random variable X has the following probability distribution. 7M

X	1	2	3	4	5	6	7	8
f(X)	K	2K	3K	4K	5K	6K	7K	8K

Find the value of $i.k$ $ii.Mean$ $iii.Variance$ $iv.P(2 \le X \le 5)$.

b) If X is a normal variate with mean 30 and standard deviation 5. Find the probabilities that (i) X lies between 26 and 40 (ii) X greater than 45 7M

OR

6 a) State and prove Baye's theorem. 7M

b) Fit a Poisson distribution to the following set of observations. 7M

x	0	1	2	3	4
f	122	60	15	2	1

|'''|'|'|''||'''||||
~~~~~~~~~~~~~~~~~~~~~~~~~

UNIT-IV

7 a) A random sample of size 100 is taken from a population with standard deviation 5.1. Given that the sample mean is 21.3, construct a (i) 95% (ii) 98% confidence interval for the population mean. 7M

b) A population consists of five numbers 2, 3, 6, 8and 11. Consider all possible samples of size 2 which can be drawn with out replacement from this population. Find 7M

(i) The mean of sampling distribution of means and

(ii) The variance of sampling distribution of means.

OR

8 a) Suppose that we want to estimate the true proportion of defectives in a very large shipment of adobe bricks, and that we want to be at least 95% confidence that the error is at most 0.04. How large a sample will we need if 10M

(i) we have no idea what the true proportion might be;

(ii) we know that the true proportion doesn't exceed 0.12?

b) Define t- distribution and explain the properties of t-curve. 4M

UNIT-V

9 a) To test the claim that the resistance of electric wire can be reduced by more than 0.050 ohm by alloying, 32 values obtained for standard wire yielded mean of 0.136 ohm and standard deviation 0.004 ohm, and another 32 values obtained for alloyed wire yielded mean 0.083 ohm and standard deviation 0.005 ohm. At 0.05 level of significance, does this support the claim? 7M

b) The breaking strength of ropes produced by a manufacturer have mean 1800 N and variance 1000 N. By a new technique in the manufacturing process, it is claimed that the breaking strength can be increased. To test this claim, a sample of 50 ropes is tested and found that the mean breaking strength is 1850 N. Can we support the claim at (i) 0.05 and (ii) 0.01, level of significance. 7M

OR

10 To reduce the amount of recycled construction materials entering land fill, it is crushed for use in the base of roadways. Green engineering practices require that their strength, resiliency modulus, be accessed. Measurements on 6 specimens of recycled materials from two different locations produced the data: 14M

Location-I	707	632	604	652	669	674
Location-II	552	554	484	630	648	610

Use the 0.05 level of significance to establish a difference in mean strength for the materials from two locations.

Code No: R2021021 **R20** SET - 3

II B. Tech I Semester Regular/Supplementary Examinations, December-2023
MATHEMATICS-IV
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

UNIT-I

1 a) Show that the function $f(z)=\sqrt{|xy|}$ is not analytic at the origin even though CR equations are satisfied thereof. 7M

b) Evaluate $\int_{1+i}^{2+4i} z^2 dz$ along the straight-line joining *1+i* and *2+4i.* 7M

OR

2 a) Show that $f(z)=z+\overline{z}$ is not analytic anywhere in the complex plane. 7M

b) Evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$ around $C:|z-1|=3$. 7M

UNIT-II

3 a) Find Taylor's series expansion of $f(z)=\frac{2z^3+1}{z^2+z}$ about the point $z=i$. 7M

b) Find Laurent's series expansion of $f(z)=\frac{7z-2}{(z+1)z(z-2)}$ in the region $1<z+1<3$. 7M

OR

4 Find the residue of $f(z)=\frac{z^3}{(z-1)^4(z-2)(z-3)}$ at its poles and hence evaluate $\oint_C f(z)dz$ where C is the circle $|z|=\frac{1}{2}$. 14M

UNIT-III

5 a) A card is drawn from a pack of 52 cards. Find the probability of getting a king or a heart or a red card. 7M

b) Find the probabilities that a random variable having the standard normal distribution will take on a value 7M
(i) between 0.87 and 1.28,
(ii) between - 0.34 and 0.62,
(iii) greater than -0.65
(v) less than -0.43 and greater than 0.43.

OR

|'''|'|'|''||'''||||
~~~~~~~~~~~~~~~~~~~~~~~~~

6 a) Show that Poisson distribution as a limiting case of binomial distribution. 7M

b) The daily high temperature in a computer server room at the university can modeled by a normal distribution with mean 68.7°F and standard deviation 1.2°F. Find the probability that, on any given day, the high temperature will be (i) between 68.3 and 70.3°F , (ii) greater than 71.5 °F. 7M

UNIT-IV

7 a) A population consists of five numbers 2, 3, 6, 8and 11. Consider all possible samples of size 2 which can be drawn with replacement from this population. Find 10M

(i) The mean of sampling distribution of means and

(ii) The variance of sampling distribution of means.

b) Define F-distribution and explain its applications. 4M

OR

8 a) A random sample of 400 items is found to have a mean of 82 and standard deviation of 18. Find the maximum error of estimate at 95% confidence. Also construct a 99% confidence interval for the true mean. 10M

b) Define central limit theorem and discuss its significance. 4M

UNIT-V

9 a) A cigarette manufacturing firm claims that its brand A line of cigarettes outsells its brand B by 8%. If it is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another sample of 100 smokers prefer brand B, test whether the 8% difference is a valid claim. 7M

b) In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B, 18.5% of a random sample 1600 school boys had the same defect. Is the difference between the populations significant? 7M

OR

10 An investigator states that the husbands are more intelligent than the wives. The following is the results of 10 samples of IQs. Test a hypothesis with a reasonable test at the 0.05 level of significance. 14M

Husbands	117	105	97	105	123	109	86	78	103	107
Wives	106	98	87	104	116	95	90	69	108	85

Code No: R2021021 **R20** SET - 4

II B. Tech I Semester Regular/Supplementary Examinations, December-2023
MATHEMATICS-IV
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

UNIT-I

1 a) Find the regular function whose imaginary part is $\frac{x-y}{x^2+y^2}$. 7M

b) Evaluate $\int_C \frac{z^2-z+1}{z-1}dz$, where C is the circle $|z|=1/2$. 7M

OR

2 a) Determine the analytic function whose real part is $e^{2x}(x\cos 2y - y\sin 2y)$. 7M

b) Evaluate $\oint_C \frac{e^z}{(z^2+\pi^2)^2}dz$ where C is $|z|=4$. 7M

UNIT-II

3 a) Find the Laurent Series Expansion of $f(z)=\frac{z^2-1}{(z+2)(z+3)}$ for $|z|>3$. 7M

b) Find the sum of the residues of $f(z)=\frac{\sin z}{z\cos z}$ at it poles inside the circle $|z|=2$ 7M

OR

4 Evaluate $\oint_C \frac{z-3}{z^2+2z+5}dz$ where C is the circle (i) $|z|=1$ (ii) $|z+1-i|=2$ (iii) $|z+1+i|=2$. 14M

UNIT-III

5 a) Of the three, the chances that an IAS officer, IPS officer or an academician will be appointed as a vice-chancellor of a university are 0.7, 0.5, and 0.2 respectively. Probabilities that the outcome based education (OBE) is promoted by these if appointed are 0.2, 0.5, and 0.7 respectively. If outcome based education is promoted, what is the probability that vice-chancellor is an academician? 7M

b) For health reasons, homes need to be inspected for randon gas which decays and produces alpha particles. One device counts the number of alpha particles that hit its detector. To a good approximation, in one area, the count for the next week follows a Poisson distribution with mean 1.3. Determine 7M
(i) The probability of exactly one particle next week.
(ii) The probability of one or more particles next week.
(iii) The probability of at least two but no more than four particles next week.
(iv) The variance of the Poisson distribution.

|'''|'|'|''||'''||||
~~~~~~~~~~~~~~~~~~~~~~~~~

OR

6 a) If a coin is tossed 12 times, find the probability of getting 7M
(i) at least two heads (ii) at most 3 heads (iii) between 5 to 8 heads and
(iv) all heads

b) Define normal distribution, and hence discuss about the area property of normal distribution. 7M

UNIT-IV

7 a) Define or state the following. 7M
(i) Population and sampling
(ii) Sampling distribution of means and variances
(iii) Central limit theorem.

b) A random sample of 400 items is found to have a mean of 82 and standard deviation of 18. Find the maximum error of estimate at 95% confidence. Also construct a 99% confidence interval for the true mean. 7M

OR

8 The efficiency expert of a computer company tested 60 engineers to estimate the average time it takes to assemble a certain computer component, getting a mean of 15.75 minutes and S.D. of 3.02 minutes. 14M
(i) Construct a 99% confidence interval for the true average time it takes to do the job.
(ii) With what confidence, we can assert that the sample mean does not differ from the true mean by more than 45 seconds?

UNIT-V

9 a) A sample of weights of 6400 men has a mean of 67.85 kg with a SD of 2.56 kg, while a sample of 1600 women has a mean of 68.55 kg with a SD of 2.52 kg. Do the data indicate the men are on the average weightier than the women? 7M

b) Out of two vending machines at a 'super bazar', the first machine fails to work 13 times in 250 trails and second machine fails to work 7 times in 250 trails. Test at 0.05 Level of significance whether the difference between the corresponding sample proportions is significant. 7M

OR

10 Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results. Test whether the two horses have the same running capacity? 14M

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	--