

PROBABILITY & STATISTICS · JNTUH R18 · EXAM STRATEGY

Predicted Paper Pattern

Based on 12 previous papers (Nov-2020 to Apr/May-2026). Use with the Easy, Medium and Tough model papers.

Slot	Unit	Most likely question (times asked in 12 papers)	Chance
1a/1b	1	Axioms of probability (5); card problem — spade or ace (3); conditional probability (2)	Very high
1c/1d	2	State Poisson / Binomial / Normal (5); $y_0e^{- x }$ (2); normal area (1)	Very high
1e/1f	3	Critical region & LOS (3); null/alternative hypothesis (4); Type I/II (3); sample size $\sigma = 1.4$ (2)	Very high
1g/1h	4	State χ^2 / t (5); conditions for χ^2 (2); $F_{0.05}(15, 7)$ (2); $P(S_1^2/S_2^2 < 4.03)$ (2)	Very high
1i/1j	5/6	Principle of least squares (8!); $x = 2y + 3$, $y = \frac{x}{8} + 6 \rightarrow r$ (3)	Almost certain
Q2/Q3	1	Bayes' theorem problem (8); alternate tossing (5); boxes of coloured balls (2)	Very high
Q4/Q5	2	Normal — "how many students" / μ , σ from % (8); sampling distribution of 5–6 numbers (6); Binomial / Poisson (6)	Very high
Q6/Q7	3	Single mean Z + CI (7); two means (5); two proportions (6); single proportion (2)	Very high
Q8/Q9	4	F-test (6); t two means — horses (3); dice 360 times χ^2 (3); paired t (2)	Very high
Q10	5	Cars data (2,7,9,1,5,12) with parabola / ae^{bx} / ax^b (3 papers in a row); quadratic 1–6 (2)	High
Q11	6	Spearman with ties (3); regression lines + prediction (4); corrected data (3)	High

HOW TO USE THE THREE PAPERS TONIGHT

- Step 1** **Easy paper** (repeat-type questions): solve it fully. These are your "sure-shot" marks.
- Step 2** **Medium paper** (same patterns, new numbers): this is closest to the real paper. Time yourself: 3 hours.
- Step 3** **Tough paper** (twists and combined questions): attempt the questions from units you feel strong in.
- Step 4** Check each answer with the key at the end of the paper. Then revise the matching unit section.

EXAM CHOICES (PART B)

Q10 vs Q11: if the Q10 curve is ae^{bx} or ax^b , the log tables take time. Spearman / regression in Q11 is usually faster. Read both before you start.

Code No: S3101

EASY · MODEL PAPER

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech III Year I Semester Examinations — Practice Model Paper 1 (EASY)****PROBABILITY AND STATISTICS**

(Common to CSE, IT) · Pattern: R18, as in the Apr/May-2026 paper

Time: 3 hours**Max. Marks: 75****Note:** i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.

iii) In Part B, answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A**(25 Marks)**

- 1.a)** State the axioms of probability. **[2]**
- b)** A card is drawn from a well-shuffled pack of 52 cards. Find the probability that it is a king or a heart. **[3]**
- c)** State the Poisson distribution and give two examples of its use. **[2]**
- d)** Find the mean and variance of the distribution $f(x) = 2e^{-2x}$, $x > 0$. **[3]**
- e)** Define Type I and Type II errors. **[2]**
- f)** A random sample of 64 items has mean 52 and standard deviation 8. Find the 95% confidence interval for the population mean. **[3]**
- g)** State the χ^2 -distribution and write the conditions for the validity of the χ^2 -test. **[2]**
- h)** Find the values of (i) $F_{0.05}$ for $\nu_1 = 15$, $\nu_2 = 7$ (ii) $F_{0.95}$ for $\nu_1 = 12$, $\nu_2 = 15$. **[3]**
- i)** State the principle of least squares. **[2]**
- j)** The regression line of x on y is $x = 0.5y + 4$ and that of y on x is $y = 0.8x + 2$. Find the correlation coefficient and the means. **[3]**

PART – B**(50 Marks)**

- 2.a)** Find the probability of drawing two red balls in succession from a bag containing 5 red and 4 black balls (i) with replacement (ii) without replacement.
- b)** A and B toss a fair coin alternately. The one who gets the head first wins. If A starts, find the chance of winning of each. **[5+5]**

OR

- 3.a)** State Bayes' theorem.
- b)** Machines A, B, C produce 25%, 35%, 40% of the total output. Of their outputs 5%, 4%, 2% are defective. A bolt is drawn at random and is defective. Find the probability that it was made by machine A, B and C. **[3+7]**
- 4.a)** The mean of a binomial distribution is 4 and the variance is 3. Find n, p and $P(X \geq 1)$.
- b)** X is normally distributed with mean 50 and standard deviation 10. Find $P(45 \leq X \leq 62)$. **[5+5]**

OR

5. A population consists of the five numbers 3, 6, 9, 15, 27. Consider all possible samples of size 2 drawn **with replacement**. Find (a) the mean of the population (b) the s.d. of the population (c) the mean of the sampling distribution of means (d) the s.d. of the sampling distribution of means. [10]

- 6.a) A sample of 100 students has a mean weight of 52 kg with a s.d. of 7 kg. Test at 5% level whether the population mean is 50 kg.

- b) Find the 95% confidence interval for the population mean. [6+4]

OR

- 7.a) Define critical region and level of significance.

- b) In a survey, 200 of 500 persons in city A and 230 of 500 persons in city B use a product. Is there a significant difference between the two cities at 5% level? [4+6]

8. The heights (in inches) of 10 students are 63, 63, 64, 65, 66, 69, 69, 70, 70, 71. Test at 5% level whether the mean height of the population is 65 inches. [10]

OR

9. A die is thrown 120 times with the following results. Face: 1, 2, 3, 4, 5, 6; Frequency: 15, 22, 18, 25, 16, 24. Test at 5% level whether the die is unbiased. [10]

- 10.a) Write the normal equations for fitting a straight line $y = a + bx$.

- b) Fit a straight line to the data: x: 1, 2, 3, 4, 5; y: 3, 5, 7, 8, 12. [3+7]

OR

11. Ranks of 8 students in Mathematics and Statistics are (1, 3), (2, 1), (3, 4), (4, 2), (5, 6), (6, 5), (7, 8), (8, 7). Compute Spearman's rank correlation coefficient. [10]

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Answer Key

Part A

1a	(1) $P(E) \geq 0$ (2) $P(S) = 1$ (3) $E_1 \cap E_2 = \phi \Rightarrow P(E_1 \cup E_2) = P(E_1) + P(E_2)$. [Unit 1, §1.4]
1b	$\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$.
1c	$P(X = r) = \frac{e^{-\lambda} \lambda^r}{r!}$, $r = 0, 1, 2, \dots$; mean = variance = λ . Examples: printing mistakes per page; defective bulbs; accidents per day.
1d	Mean = $\int_0^\infty 2xe^{-2x} dx = \frac{1}{2}$; $E(X^2) = \frac{1}{2}$; variance = $\frac{1}{2} - \frac{1}{4} = \frac{1}{4}$.
1e	Type I: reject H_0 when it is true (α). Type II: accept H_0 when it is false (β). [Unit 3, §3.5]
1f	$52 \pm 1.96 \cdot \frac{8}{8} = 52 \pm 1.96 = (50.04, 53.96)$.
1g	$\chi^2 = \sum \frac{(O-E)^2}{E}$; conditions: $N \geq 50$, each $E \geq 5$, independent observations, linear constraints. [Unit 4, §4.7]
1h	(i) 3.51 (ii) $\frac{1}{F_{0.05}(15,12)} = \frac{1}{2.62} = 0.382$.
1i	The best-fit curve makes $S = \sum [y_i - f(x_i)]^2$ minimum. [Unit 5, §5.1]
1j	$b_{xy} = 0.5$, $b_{yx} = 0.8$, $r = \sqrt{0.4} = 0.632$. Means: solve both lines: $\bar{x} = 8.33$, $\bar{y} = 8.67$.

Part B

Q2. (a) Two red balls

(i) $\left(\frac{5}{9}\right)^2 = \frac{25}{81} = 0.309$; (ii) $\frac{5}{9} \cdot \frac{4}{8} = \frac{5}{18} = 0.278$. (b) $P(A) = \frac{1/2}{1-1/4} = \frac{2}{3}$, $P(B) = \frac{1}{3}$.

Q3. Bayes — machines

$P(D) = 0.0125 + 0.014 + 0.008 = 0.0345$. $P(A|D) = \frac{0.0125}{0.0345} = 0.362$; $P(B|D) = 0.406$; $P(C|D) = 0.232$. (Sum = 1 ✓)

Q4. Binomial / Normal

(a) $q = \frac{3}{4}$, $p = \frac{1}{4}$, $n = 16$; $P(X \geq 1) = 1 - (0.75)^{16} = 0.990$. (b) $z = -0.5$, 1.2 : $A(0.5) + A(1.2) = 0.1915 + 0.3849 = 0.5764$.

Q5. Sampling distribution

$\mu = 12$, $\sigma = 8.485$; $5^2 = 25$ samples; $\mu_{\bar{x}} = 12$; $\sigma_{\bar{x}} = \frac{8.485}{\sqrt{25}} = 1.697$.

Q6. Single mean

$Z = \frac{52-50}{7/\sqrt{10}} = 2.86 > 1.96$: reject H_0 . CI = $52 \pm 1.372 = (50.63, 53.37)$.

Q7. Two proportions

$p_1 = 0.40$, $p_2 = 0.46$, $P = 0.43$; S.E. = 0.0313; $Z = -1.92$; $|Z| < 1.96$: accept H_0 . No significant difference.

Q8. t single mean

$$\bar{x} = 67, S = 3.127, t = \frac{2}{3.127/\sqrt{10}} = 2.02 < t_{0.025}(9) = 2.262: \text{accept } H_0. \text{ Mean height is 65.}$$

Q9. χ^2 die

$$E = 20 \text{ each; } \chi^2 = \frac{25+4+4+25+16+16}{20} = 4.5 < 11.07: \text{accept. The die is unbiased.}$$

Q10. Straight line

$$\Sigma x = 15, \Sigma y = 35, \Sigma x^2 = 55, \Sigma xy = 126. 5a + 15b = 35, 15a + 55b = 126 \text{ Multiply the first by 3 and subtract: } 10b = 21 \Rightarrow b = 2.1, a = 0.7. \mathbf{y = 0.7 + 2.1x.}$$

Q11. Spearman

$$D: -2, 1, -1, 2, -1, 1, -1, 1; \Sigma D^2 = 14; \rho = 1 - \frac{84}{504} = 0.833.$$