Reg. No.															

B.Tech. DEGREE EXAMINATION, NOVEMBER 2016
Fifth Semester

MA1005 – PROBABILITY AND STATISTICS

(For the candidates admitted during the academic year 2013 – 2014 and 2014 -2015)
(Statistical tables and graph sheets for SQC are to be provided)

Note:

(i) **Part - A** should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45th minute.

(ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: Three Hours Max. Marks: 100

PART – A (20 × 1 = 20 Marks)
Answer **ALL** Questions

1. The probability that a manager will travel by train is $\frac{1}{5}$ and by plane is $\frac{2}{3}$. What is the probability of his travelling by train on plane?
   (A) $\frac{2}{15}$ (B) $\frac{13}{15}$
   (C) $\frac{11}{15}$ (D) $\frac{4}{15}$

2. The distribution function of a continuous random variable X is $F(x) = 1-(1+x)e^{-x}, x \geq 0$, then the pdf of X is
   (A) xe^{-x} (B) xe^{x}
   (C) e^{x} (D) e^{-x}

3. The expectation of the number on a die when thrown is
   (A) $\frac{1}{6}$ (B) 2
   (C) 3 (D) $\frac{7}{2}$

4. If $E(x^2) = 8$ and $E(x) = 2$, then Var (X) is
   (A) 16 (B) 8
   (C) 4 (D) 2

5. The moment generating function of the binomial distribution is
   (A) $(p+qe^{t})^{n}$ (B) $(q+pe^{t})^{n}$
   (C) $(p-qe^{t})^{n}$ (D) $(q-pe^{t})^{n}$

6. If X is a Poisson variate such that $E(x^2) = 6$ find E(x)
   (A) 1 (B) 2
   (C) 0 (D) 6

7. The variance of geometric distribution whose pmf is $q^{r-1}.p$ for r = 1,2,3,.....∞ is
   (A) $\frac{1}{p}$ (B) $\frac{1}{p^2}$
   (C) $\frac{q}{p^2}$ (D) $\frac{p}{q^2}$

8. X is a normal random variate with mean 16 and S.D. 3. The $(X \geq 19)$ is
   (A) 0.1587 (B) 0.8413
   (C) 0.3413 (D) 0.6587

9. In large samples the $|Z_\alpha|$-value for two tailed test at $\alpha = 1\%$ level of significance is
   (A) 1.96 (B) 1.645
   (C) 2.58 (D) 2.33

10. In test of significance for single S.D, the Z-test static value is
   (A) $\frac{s-\sigma}{\left(\frac{\sigma}{\sqrt{2n}}\right)}$ (B) $\frac{s-\sigma}{\left(\frac{\sigma}{\sqrt{n}}\right)}$
   (C) $\frac{s+\sigma}{\left(\frac{\sigma}{\sqrt{2n}}\right)}$ (D) $\frac{s+\sigma}{\left(\frac{\sigma}{\sqrt{n}}\right)}$

11. Given observed frequencies are 882, 313, 287, 118 and the expected frequencies are 900, 300, 300, 100. Then the Chi-square test statistic value is
   (A) 0.61 (B) 1.10
   (C) 1600 (D) 4.73

12. The test statistic for paired t-test is defined as
   (A) $\bar{d} + S_d\sqrt{n-1}$ (B) $\bar{d} - S_d\sqrt{n-1}$
   (C) $\frac{\bar{d}}{\left(\frac{S_d}{\sqrt{n-1}}\right)}$ (D) $\frac{S}{\sqrt{n}}$

13. The range of F-distribution is
   (A) 0 to ∞ (B) $-\infty$ to ∞
   (C) -1 to ∞ (D) 1 to ∞

14. In two way ANOVA classification, the degrees of freedom for residuals with h-rows and k-columns is
   (A) $(h-1)/(k-1)$ (B) $(h-1)(k-1)$
   (C) $(h-1)+(k-1)$ (D) $(h-1)-(k-1)$

15. The Spearman's formula for rank correlation coefficient between X and Y is, (where D is the difference of ranks)
   (A) $1-\frac{6\Sigma(D)^2}{n(n^2-1)}$ (B) $1+\frac{6\Sigma(D)^2}{n(n-1)}$
   (C) $1-\frac{6\Sigma(D)^2}{n(n^2+1)}$ (D) $1+\frac{6\Sigma(D)^2}{n(n^2+1)}$

16. If $b_{xy} = -0.8$ and $b_{yx} = -0.2$, then the value of correlation coefficient is
(A) +0.16 (B) –0.16
(C) +0.4 (D) –0.4

17. The technique of control charts was pioneered by
(A) Gusset (B) Robert
(C) W.A. Shewhart (D) R.A. Fisher

18. The lower control limit for the sample range chart, if n = 4, $\bar{R} = 1.33$, $D_3 = 0$ and $D_4 = 2.282$ is
(A) 0 (B) 3.04
(C) 1.33 (D) 2.282

19. The upper control limit for the sample S.D s-charts, if n = 4, $\bar{s} = 4.02$, $B_3 = 0$, $B_4 = 2.266$
(A) 4.02 (B) 0
(C) 9.11 (D) 2.28

20. The upper control limit for np-cahrt, where n = 100, and $\bar{p} = 0.085$ is
(A) 0.134 (B) 16.867
(C) 0 (D) 8.500

PART – B (5 × 4 = 20 Marks)
Answer **ANY FIVE** Questions

21. If An and B are two events such that $P(A \cup B) = \frac{3}{4}, P(A \cap B) = \frac{1}{4}, P(\bar{A}) = \frac{2}{3}$. Determine the value of P(B).

22. Assuming that the number of cars passing a junction obeys a Poisson distribution if the probability of no cars pass in 1 minute is 0.20, what is the mean of the distribution?

23. A boy is throwing stores at a target at any trial with probability is 0.5. What is the probability that his 10^{th} throw is his 5^{th} hit.

24. Define the terms
(i) Parameters and statistics
(ii) Type I and Type II errors

25. A random sample of 10 students gave a mean weight of 58 kgs with S.D of 4 kgs. Find the 95% confidence limits for the population mean.

26. The two lines of regression are $x + 2y - 5 = 0$; and $2x + 3y - 8 = 0$. Find the mean values of x and y.

27. Find the lower and upper control limits for the C-chart when $\bar{C} = 6$.

PART – C (5 × 12 = 60 Marks)

Answer **ALL** Questions

28. a. A random variable X has the following probability limitation

x:	–2	–1	0	1	2	3
P(x):	0.1	k	0.2	2k	0.3	3k

(i) Find the value of k

(ii) Evaluate P(X<2) and P(–2<x<2)

(iii) Obtain the cumulative distribution of X:F(x) and

(iv) Determine the mean of X.

(OR)

b. The amount of bread (in hundreds of kgs) that a certain bakery is able to sell in a day is random variable X with a pdf is given by $f(x) = \begin{cases} Ax, & if\ 0 \le x < 5 \\ A(10-x), & if\ 5 \le x < 10 \\ 0 & otherwise \end{cases}$

(i) Determine the value of A

(ii) Find the probability that in a day the sales in more than 500 kgs

(iii) Obtain the probability that in day the sales is between 250 and 750 kgs.

29. a. Obtain the Moment Generating Function of Exponential distribution, and hence find its mean and variance.

(OR)

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

30. a.i. 15.5 percent of a random sample of 1600 under graduates were smokes, where as 20% of a random sample of 900 post graduates were smokers in a state. Use at 1% level of significance, can we conclude that less number of undergraduates are smokers than the post graduates?

ii. The S.D of a random sample of 1000 is found to be 2.6 and the S.D of another random sample of 500 is 2.7. Assuming the samples to be independent, use at 1% of significance, test whether the two samples could have come from population with the same S.D?

(OR)

b. The following table gives for a sample of married women, the level of education and the marriage adjustment score

Level of equation		Marriage adjustment				
		Very low	Low	High	Very high	Total
	College	24	97	62	58	241
	High school	22	28	30	41	121
	Middle school	32	10	11	20	73
	Total	78	135	103	119	435

Can you conclude from the above data that the levels of education and the marriage adjustment are independent?

31. a. From the following data:

x:	22	26	29	30	31	31	34	35
y:	20	20	21	29	27	24	27	31

(i) Obtain the equations of regression lines and hence
(ii) Calculate the correlation coefficient between X and Y
(iii) Estimate the value of Y, when X = 38, and X, when Y = 18.

(OR)

b. Using TWO-WAY ANOVA, analyze your data and state your conclusion

		Machine types			
		A	B	C	D
Workers	1	44	38	47	36
	2	46	40	52	43
	3	34	36	44	32
	4	43	38	46	33
	5	38	42	49	39

32. a. Given below are the values of sample mean $\bar{X}$ and sample range R for 10 samples, each of size %. Draw the approximate sample mean $\left(\overline{\bar{X}}\right)$ and sample Range $\left(\bar{R}\right)$ charts (in graph sheets) and comment on the state of control of the process

Sample number:	1	2	3	4	5	6	7	8	9	10
Sample mean:	43	49	37	44	45	37	51	46	43	47
Sample range:	5	6	5	7	7	4	8	6	4	6

(OR)

b. 10 samples each of the size 50 were inspected and the number of defective in the inspection were: 2,1,1,2,3,5,5,1,2,3. Draw the $n\bar{p}$-chart (in graph sheet) for defective, and comment on the state od control.

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