	Reg. No. :
(2) Jr	Owartian Para C. 1 5079
Mr.	Question Paper Code: 5078

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017 Fourth/Fifth Semester Mechanical Engineering MA 6452 – STATISTICS AND NUMERICAL METHODS (Regulations 2013)

(Common to Mechanical Engineering (Sandwich), Automobile Engineering, Mechatronics Engineering)

Time: Three Hours Maximum: 100 Marks

Answer ALL questions.

PART - A

 $(10\times2=20 \text{ Marks})$

- 1. What is meant by level of significance and critical region?
- 2. State any two applications of Chi-square test.
- 3. What is the aim of the design of experiment?
- 4. What is a completely randomized design?
- 5. What are the merits of Newton-Raphson method?
- 6. Distinguish between Gauss elimination and Gauss-seidel methods.
- 7. What is meant by interpolation?
- 8. What is the order of error in Trapezoidal and Simpson's one-third rules?
- 9. What is main difference between single and multistep methods in solving first order ordinary differential equation?
- 10. State the modified Euler's formula for first order ordinary differential equation.

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hours and st bulbs from co	andard de mpany Q Are the bu	eviation of showed a albs of con	of 82 hor mean lit	urs. Ar fe 1248	nother ran hours and	dom sample of 100 standard deviation bs of company Q at
ii) A random sa 101, 107, 110 mean IQ of 1	and 120.	Do these	data sup	port tl	g IQ's 70, ne assump	83, 88, 95, 98, 100, tion of a population
b) i) Time taken b	y worker	s in perfo	rming a	job is	given belo	w:
Method 1		6 26	27	23	22	
Method 2	27 3	33 42	35	34	38	
Test whether the time distr						the variances of
ii) Using the dat whether a per in Statistics.	ta given ir rson's abil	n the follo lity in Ma	wing ta themat	ble to t ics is in	est at 1% l dependen	evel of significance t of his/her interest

		Ability in Mathematics				
	to track the	Low	Average	High		
	Low	63	42	15		
Interest in Statistics	Average	58	61	31		
	High	14	47	29		

12. a) The following data represent a certain person to work from Monday to Friday by four different routes.

		Days Days							
	redel	Mon	Tue	Wed	Thu	Fri			
	1	22	26	25	25	31			
D	2	25	27	28	26	29			
Routes	3	26	29	33	30	33			
	4	26	28	27	30	30			

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Test at 5% level of significance whether the differences among the means obtained for the different routes are significant and also whether the differences among the means obtained for the different days of the week are significant. (16)

(OR)

b) Four air-conditioning compressor designs were tested in four different regions of India. The test was repeated by installing additional air conditioners in a second cooling season. The following are the times to failure (to the nearest month) of each compressor tested.

		Replicate 1				Replicate 2			
		A	В	С	D	A	В	С	D
Design	Northeast	58	35	72	61	49	24	60	64
	Southeast	40	18	54	38	38	22	64	50
	Northwest	63	44	81	52	59	16	60	48
	Southwest	36	09	47	30	29	13	52	41

(16)

Test at the 0.05 level of significance whether the differences among the means determined for designs, for regions, and for replicates are significant and for significance of the interaction between compressor designs and regions. (16)

- 13. a) i) Find, by Newton-Raphson method, a positive root of the equation $3x \cos x 1 = 0$, correct to 4 decimal places. (8)
 - ii) Using Gauss-Jordan method, find the inverse of $A = \begin{pmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{pmatrix}$. (8)
 - b) i) Solve, by Gauss-Seidel method, the system of following equations, correct to three decimal places.

$$27x + 6y - z = 85$$
, $x + y + 54z = 110$, $6x + 15y + 2z = 72$. (8)

ii) Find the numerically largest Eigenvalue and the corresponding

eigenvector of a matrix
$$A = \begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$$
. (8)

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14. a) i) Using Lagrange's interpolation formula, find the polynomial f(x) form the following data:

ii) Find the value of cos(1.74), using suitable formula from the following data. (8)

x : 1.7 1.74 1.78 1.82 1.86 sin(x): 0.9916 0.9857 0.9781 0.9691 0.9584 (OR)

b) i) From the following values, find f(x) and hence find f (6) by Newton's divided difference formula.

 divided difference formula.

 x
 :
 1
 2
 7
 8

 f(x)
 :
 1
 5
 5
 4

(8)

- ii) Evaluate $\int_{1}^{1.2} \int_{1}^{1.4} \frac{1}{1+x} dxdy$ by Trapezoidal rule with h = k = 0.1. (8)
- 15. a) i) Using Taylor series method, find the value of y at x = 0.1, if y satisfies the

equation $\frac{dy}{dx} = x^2 - y$ given that y = 1 when x = 0, correct to 3 decimal places. (8)

- ii) Solve the equation $\frac{d^2y}{dx^2} = x + y$ with boundary conditions y(0) = 1 = y(1) by finite difference method, by taking 4 subintervals. (8)
- b) i) Using R-K method of fourth order, find the value of y at x = 0.1, if y satisfies the equation $\frac{dy}{dx} = x + y^2$ given that y = 1 when x = 0, correct to 3 decimal places. (8)
 - ii) Given $\frac{dy}{dx} = x^3 + y$, y(0) = 2, y(0.2) = 2.073, y(0.4) = 2.452, y(0.6) = 3.023, compute y (0.8) by Milne's method. (8)