

## MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATIONS, MUMBAI

## Examination-April, 2016 (Two Year Diploma Courses)

## GROUP-ALL GROUPS

[TIME ALLOWED — 3 HOURS]

(MARKS — 70)

## ELECTIVE-II— BUSINESS MATHEMATICS (THEORY)

Notes.— (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

Marks

1. (a) Fill in the blanks (any eight) :—

8

(i) If  $y = e^x$  then  $\frac{dy}{dx} = \dots\dots\dots$

(ii)  $\int \cos^{-1} x \times dx = \dots\dots\dots$

(iii) If  $\log_{10}^2 = 0.30103$  then find the value of  $\log_{10}^{128} = \dots\dots\dots$

(iv) If  $f(x) = 7x + a \log_{\frac{81}{9}}$  and  $f(4) = 54$ , then  $a = \dots\dots\dots$

(v)  $5^2 + 6^2 + 7^2 + 8^2 + \dots\dots\dots + 19^2 + 20^2 = \dots\dots\dots$

(vi)  $\binom{4}{0} + \binom{4}{1} + \binom{4}{2} + \binom{4}{3} + \binom{4}{4} = \dots\dots\dots$

(vii)  $\lim_{x \rightarrow 5} \frac{(x^4 - 625)}{(x - 5)} = \dots\dots\dots$

(viii)  $\frac{d}{dx}(e^{5x} + 5a^x - e^{5e}) = \dots\dots\dots$

(ix) Complete the D'Morgans law  $(P \vee Q \vee R)' = \dots\dots\dots$

(x)  $\dots\dots\dots$  is the range of the  $4\cos(x/4)$  function.

(b) Solve the following (any four) :—

4

(i) Find the cofactor of the elements of the following matrix.

$$\begin{bmatrix} 1 & -5 \\ -7 & 2 \end{bmatrix}$$

(ii) Find values of  $x$  and  $y$  using Cramer's rule  $7x - 2y = 4$  and  $x + y = 3$ .

(iii) Find value of  $x$  if  $\frac{1}{4!} + \frac{3}{6!} = \frac{x}{8!}$

(iv) Find  $\frac{dy}{dx}$  if  $x = e^{\cos t}$  and  $y = e^{\sin t}$

(v) Integrate the following function with respect to  $x$ 

$$\int \sin^2 x \, dx$$

[ Turn over

(c) Match the following :—

4

"A" Group

"B" Group

- |   |          |
|---|----------|
| (i) Arithmetic mean of 54.1, 54.5, 66, 52 and 43.4 is               | (a) 50   |
| (ii) Median of two digit natural number arranged in ascending order | (b) 50.5 |
| (iii) $5 \log_{10} 100000 + \log_{10} 10$                           | (c) 52.5 |
| (iv) Standard Deviation of 500, 550, 450                            | (d) 54.5 |
|   | (e) 54   |

2. Attempt any two of the following :—

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- (a) Calculate the range for following ungrouped frequency distribution of production of 100 days. Also calculate coefficient of range.

Production (in million tons)	100	105	110	115	120
No. of days	28	32	52	48	40

(b) Evaluate

$$(i) \int \frac{3}{\sqrt{3x-2} + \sqrt{3x-5}} dx$$

$$(ii) \int_0^1 \frac{1}{2x^2 + x + 1} dx$$

- (c) From the two regression equations,  $4y=9x+15$ ;  $25x=6y+7$  find,  $\bar{x}$ ,  $\bar{y}$  and  $r$ .
- (d) Shri Anil wants to invest at most \$ 60000 in Fixed Deposit (FD) and Public Provident Fund (PPF). He wants to invest at least \$ 20000 in FD and \$ 15000 in PPF. The rate of interest on FD is 8% and that of PPF is 10% p.a. formulate the above problem as L. P. P. to determine maximum yearly income.

3. Attempt any two of the following :—

12

- (a) For a distribution, mean=100, mode=80 and S. D.=20. Find Pearsonian Coefficient of skewness  $SK_2$
- (b) Prove that—
- (i)  $\sin^4\theta - \cos^4\theta = \sin^2\theta - \cos^2\theta$
- (ii)  $(1+\tan^2A) \cos^2A = 1 - 2\sin^2(A/2)$
- (c) Solve the differential equation  $(x + 2y^3) \frac{dy}{dx} = y$
- (d) Differentiate with respect to  $x$  —

$$\frac{dy}{dx} + y \sec x = \tan x$$

4. Give brief answers (any two) :—

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- (a) Three cars were sold through agent for \$ 160000; \$ 148000 and \$ 150000 respectively, the rate of commission were 17.5 % and 12.5% on first and third car respectively. If on the whole the agent receives 14% commission on the whole sales, find the rate of commission paid on the third car.

- (b) Calculate CDR for the districts A and B and compare them.

Age group	City A		City B	
	No. of persons	No. of Deaths	No. of persons	No. of Deaths
0-10	1000	18	3000	70
10-55	3000	32	7000	50
55 and above	2000	41	1000	24

- (c) Solve following simultaneous equations by any matrix method

$$2X - Y = 9;$$

$$X + Y = 6.$$

- (d) For a distribution,  $\mu_2 = 16$  and  $\mu_3 = -20$ . Find the coefficient of Skewness  $\gamma_1$ .

5. Attempt the following (any four) :—

16

- (a) In a beauty contest, two judges ranked the 12 entries as follows :—

x	1	2	3	4	5	6	7	8	9	10	11	12
y	12	9	6	10	3	5	4	7	8	2	11	1

What degree of agreement is there between the two judges?

- (b) Find the Harmonic Mean (H. M.) of two positive numbers whose A. M. is 7 and G.M. is 10.

- (c) Find n if  $(n+1)! = 42(n-1)!$

- (d) A train travelled between two stations and distance and time were recorded as below :—

Distance (in Km)	80	120	160	200	240
Time (hr)	2	3	4	5	6

Draw scatter diagram and identify the type of correlation.

- (e) A fair coin is tossed 12 times. Find the probability of getting —

(i) exactly 7 heads.

(ii) at least 2 heads.

(iii) at most 2 heads.

- (f) Find the sequence that minimizes total elapsed time (in hours) required to complete the following jobs on two machines  $M_1$  and  $M_2$  in the order  $M_1 M_2$ . Also find the minimum elapsed time T and idle time for the two machines.

Job	A	B	C	D	E
$M_1$	5	1	9	3	10
$M_2$	2	6	7	8	4