GOVERNMENT OF KARNATAKA

KARNATAKA STATE PRE-UNIVERSITY EDUCATION EXAMINATION BOARD

II YEAR PUC EXAMINATION 2017 - MARCH

SCHEME OF VALUATION

Subject Code : 35 (05) Subject : Basic mathematics.

Qn. No.	Part A	Marks
1.	'x is not an odd integer'	1 mark
2	4	1 mark
3	5	1 mark
4	8	1 mark
5	18-10-2001	1 mark
6.	Yield = $\frac{\text{Nominal Interest}}{\text{Amount Invested}} \times 100$	1 mark
7.	2	1 mark
8	4	1 mark
9	$\frac{dy}{dx} = \frac{1}{x}$	1 mark
10.	$\log(3x+5) + C$	1 mark
	Part B.	
11.	Converse: If $\sqrt{2}$ is an integer then 2 is an even number.	1 mark
	Inverse: If 2 is not an even number then $\sqrt{2}$ is not an integer.	1 mark
12.	No. of permutations of the word 'MOTHER' is $6! = 720$	1 mark
	No. of words that begin with M and end with R = $4! = 24$	1 mark

Scheme of Valuation : BASIC MATHEMATICS

Subject Code : 75

Qr. No.		Marks
13.	No. of straight lines is $^{14}C_2 - {}^4C_2 + 1$	— 1 mark
	$= 86$ lines	→ 1 mark
14.	Solving for x and y, $x = \frac{2}{2}$	→ 1 mark
	$x = \frac{\Delta_1}{\Delta} = \frac{2}{1} = 2$, $y = \frac{\Delta_2}{\Delta} = \frac{1}{1} = 1$. $y = 1$	→ 1 mark
15.	$A+B = \begin{pmatrix} 0 & 0 \\ 0 & 6 \end{pmatrix}$	→ 1 mark
	$(A+B)^T = \begin{pmatrix} 0 & 0 \\ 0 & 6 \end{pmatrix}$	→ 1 mark
16.	$15 : 180 :: 450 : x$	→ 1 mark
	$x = 3600$	→ 1 mark
17.	Combined average $= \frac{12\times4 + 8\times5}{20} = 4.4$ feet.	→ 1 mark for each step
18.	Centre $= (2,3)$	→ 1 mark
	Radius $= \sqrt{12}$	→ 1 mark
19.	$k = \lim_{x\to1} (4x+3)$	→ 1 mark
	$k = 7$	→ 1 mark
20.	$\frac{dy}{dx} = xe^x + e^x$	→ 2 marks
21.	$\frac{dx}{dt} = 2at$, $\frac{dy}{dt} = 2a$	→ 1 mark
		→ 1 mark
	$\therefore \frac{dy}{dx} = \frac{2a}{2at} = \frac{1}{t}$	
22.	$I = \int 2x + 5 + \frac{1}{x}$	→ 1 mark
	$= x^2 + 5x + \log x + C$	→ 1 mark

Scheme of Valuation : BASIC MATHEMATICS 3 Subject Code : 75

Qn. No.	Part C	Marks
23)	1 mark, 1 mark, 1 mark ①, 1 mark ②, 1 mark ① → ② p q ~p ~p∧q p∨q ① → ② T T F F T T T F F F T T F T T T T T F F T F F T	
24)	(i) Exactly 2 ladies $= {}^5C_2 \times {}^7C_4 = 350$ — 2 marks	
	(ii) Atleast 2 ladies =	
	$= {}^5C_2 \times {}^7C_4 + {}^5C_3 \times {}^7C_3 + {}^5C_4 \times {}^7C_2 + {}^5C_5 \times {}^7C_1$ ⟶ 2 marks	
	$= 350 + 350 + 105 + 7$	
	$= 812$ ⟶ 1 mark	
25	$\frac{3x+5}{(x+2)^2(x-3)} = \frac{A}{x+2} + \frac{B}{(x+2)^2} + \frac{C}{x-3}$ ⟶ 1 mark	
	Solving for A, B, C $A = \frac{-14}{25}$, $B = \frac{1}{5}$, $C = \frac{14}{25}$ — 1 mark each	
	$Ans = \frac{-14}{25(x+2)} + \frac{1}{5(x+2)^2} + \frac{14}{25(x-3)}$ ⟶ 1 mark	
26	$A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$ $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ $B = \begin{bmatrix} 9 \\ 10 \\ 14 \end{bmatrix}$ ⟶ 1 mark	

Qn. No.		Marks
	$\|A\| = 4$; →	1 mark
	$A^{-1} = \frac{1}{4}\begin{bmatrix} 4 & 1 & -3 \\ -8 & 1 & 5 \\ 4 & -1 & -1 \end{bmatrix}$	
	$X = A^{-1}B = \frac{1}{4}\begin{bmatrix} 4 & 1 & -3 \\ -8 & 1 & 5 \\ 4 & -1 & -1 \end{bmatrix}\begin{bmatrix} 9 \\ 10 \\ 14 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$	1 mark each
	$x=1$, $y=2$, $z=3$; →	
II	Part C	
(27)	Men Hours Days 15 12 21 21 10 x	1 mark
	$15:21 :: x:21$ (1) →	1 mark
	$12:10 :: x:21$ (2) →	1 mark
	Solving for x, $\frac{15}{21} \times \frac{12}{10} = \frac{x}{21}$	1 mark
	$x = 18$ days. →	1 mark
(28)	$\frac{12x}{120} + \frac{15(1000-x)}{75} = 148$ →	2 marks
	Solving for x we get $x = 520$ →	2 marks
	Ist investment = Rs 520	
	II investment = Rs 480 →	1 mark
(29)		

P.T.O

Scheme of Valuation : BASIC MATHEMATICS 3 Subject Code : 75

Qn. No		Marks
(29)		

Units	Total output	Cumulative average time/unit	Total hrs	Av. hrs per addn unit
1	1	1000	1000	1000
1	2	$\frac{90}{100} \times 1000 = 900$	1800	800
2	4	$\frac{90}{100} \times 900 = 810$	3240	720

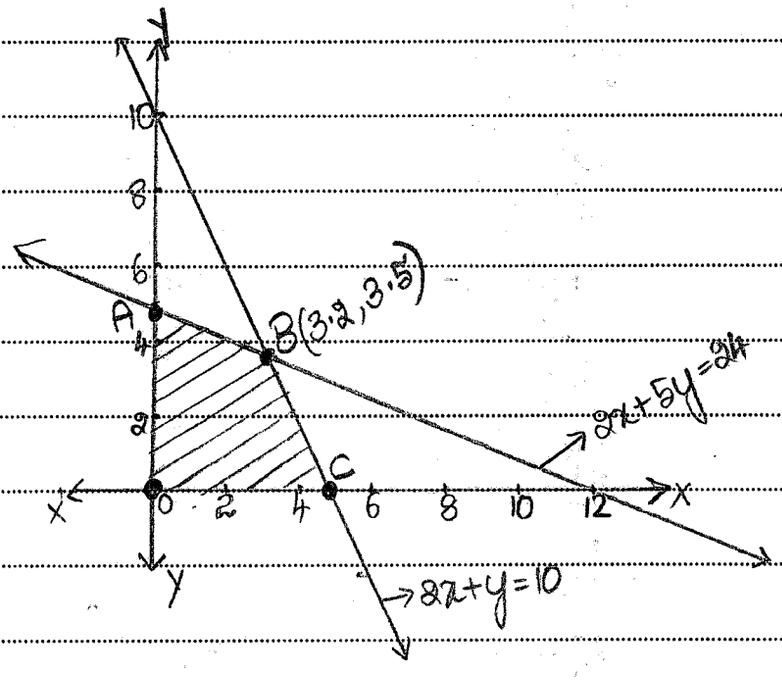
→ 3 marks

Total labour hours = 3240 hrs → 1 mark

Total labour cost = 3240 × 20

= RS 64800 → 1 marks

(30)



→ 3 marks

Corner points	Z
O(0,0)	$Z = 6(0) + 8(0) = 0$
A(0, 4.8)	$Z = 6(0) + 8(4.8) = 38.4$
B(3.2, 3.5)	$Z = 6(3.2) + 8(3.5) = 47.2$ ✓(max)
C(5, 0)	$Z = 6(5) + 8(0) = 30$

1 mark

Optimal solution is $Z = 47.2$ when $x = 3.2$ and $y = 3.5$ → 1 mark

Qn. No.		Marks
31)	Let the eqn of $\odot^{le}$ be $x^2+y^2+2gx+2fy+c=0$ →	1 mark
	Passing through $(0,0) \Rightarrow c=0$ →	1 mark
	Passing through $(1,1)$ and $(2,0)$	
	we get $g=-1$	2 marks
	$f=0$	
	∴ Equation of the circle is given by	
	$x^2+y^2-2x=0$ →	1 mark
32)	$\frac{dy}{dx} = 3x^2-18x+15$ →	1 mark
	$= 3(x^2-6x+5) = 3(x-5)(x-1)$	
	$\frac{dy}{dx} = 0 \Rightarrow x=5, 1$ →	1 mark
	$\frac{d^2y}{dx^2} = 6x-18$	
	at $x=5$ $\frac{d^2y}{dx^2} = 12>0$ (min at $x=5$)	1 mark
	at $x=1$ $\frac{d^2y}{dx^2} = -12<0$ (max at $x=1$)	
	minimum value $= f(5) = -26$ →	1 mark
	maximum value $= f(1) = 6$ →	1 mark
33)	$y = \log\left(x+\sqrt{x^2+1}\right)$	
	$\frac{dy}{dx} = y_1 = \left(\frac{1}{x+\sqrt{x^2+1}}\right)\left(1+\frac{2x}{2\sqrt{x^2+1}}\right)$ →	1 mark
	$y_1 = \frac{1}{\sqrt{x^2+1}}$ →	1 mark
	$\sqrt{x^2+1}\, y_1 = 1$ →	1 mark
	Squaring $(x^2+1)y_1^2 = 1$	
	Derivative of the above equation $(x^2+1)2y_1y_2 + 2x\cdot y_1^2 = 0$	1 mark
	$(\div 2y_1) \rightarrow$ i.e $(x^2+1)y_2 + xy_1 = 0$	1 mark

Qr. No		Marks
34)	$I = \int \frac{x-1}{(x-2)(x-3)}\,dx = \int \frac{A}{x-2}\,dx + \int \frac{B}{x-3}\,dx$ → 1 mark	
	Using Partial fraction method $A = -1$, $B = 2$ → 2 marks	
	$\therefore I = \int \frac{-1}{x-2}\,dx + \int \frac{2}{x-3}\,dx$	
	$= -\log(x-2) + 2\log(x-3) + C$ → 2 marks	
35)	4 Hindi, 4 Kannada, 5 Eng books can be arranged in $(4+4+5)! = 6!$ ways → 1 mark	
	(i) Kannada Books are together	
	Total no. of ways 4 Kannada books among themselves can be arranged = $4!$	
	Kannada	
	4 Books as 1 unit along with 4 Hindi and 5 English can be arranged in $10!$	
	$\therefore$ Total number of ways $= 10!\,4!$ ways → 2 marks	
	Similarly	
	(ii) Hindi Books are together and Kannada Books are together is $4! \times 4! \times 4!$ → 1 mark	
	(iii) No two English Books are together	
	$= 11! \times {}^{12}P_5$ ways → 1 mark	

Qn. No.		Marks
35 b)	Banker's Discount (B.D) $= \frac{3000 \times 12}{100} \times \frac{5}{12} =$ Rs 150	1 mark
	True Discount $= \frac{3000}{\left(1+\frac{12}{100}\times\frac{5}{12}\right)} \times \frac{12}{100} \times \frac{5}{12}$	2 marks
	$=$ Rs 142.85	
	Discounted value $= F(1-tr)$	2 marks
	$= 3000\left(1-\frac{5}{12}\times\frac{12}{100}\right)$ Rs	
	$= 3000(1-.05) = 8850$	
36 a)	$\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$ $R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$ $\begin{vmatrix} 1 & a & bc \\ 0 & b-a & c(a-b) \\ 0 & c-a & b(a-c) \end{vmatrix}$	2 marks
	$= (b-a)(c-a)\begin{vmatrix} 1 & a & bc \\ 0 & 1 & -c \\ 0 & 1 & -b \end{vmatrix}$ on Expansion	2 marks
	$\Rightarrow (b-a)(c-a)(c-b)$	1 mark
	$\Rightarrow (a-b)(b-c)(c-a) =$ RHS	
b)	T_5 and T_6 are the middle terms.	1 mark
	$T_5 = T_{4+1} = {}^9C_4 (x^2)^5 \left(\frac{2}{x}\right)^4 = {}^9C_4 \times 16 \times x^6$	2 marks
	$T_6 = T_{5+1} = {}^9C_5 (x^2)^4 \left(\frac{2}{x}\right)^5 = {}^9C_5 \times 32 \times x^3$	2 marks

Scheme of Valuation

Qn. No.		Marks
37		
a)	Case (i) : n is +ve integer	→ 2 marks
	Case (ii) : n is −ve integer	→ 2 marks
	Case (iii) : n is equal to zero.	→ 1 mark
b)	Diagram in standard form	→ 1 mark
	Explanation	→ 2 mark
	Derivation of the theorem	→ 2 marks
38	$A = \int q\, dx$	→ 1 mark
d)	$x = 0$ and $x = 5$	→ 2 marks
	$A = \int_0^5 (\sqrt{5}(x)^{1/2} - x)\, dx$	→ 1 mark
	$= \frac{25}{6}$ sq. units.	→ 1 mark
i)	$A = \pi r^2$, $\frac{dr}{dt} = 3$ cm/min, $r = 2$ cms	→ 1 mark
	$\frac{dA}{dt} = 2\pi r \cdot \frac{dr}{dt} = 6\pi \times 2 = 12\pi$ cm^2/min	→ 2 marks
	$C = 2\pi r$, $\frac{dC}{dt} = 2\pi \cdot \frac{dr}{dt}$	→ 1 mark
	$\frac{dC}{dt} = 6\pi$ cm/min.	→ 1 mark
	Part E.	
39 a)	$(1.08)^3 = (1 + .08)^3$	→ 1 mark
	$= 1^3 + 3(1)^2(.08) + 3(1)(.08)^2 + (.08)^3$	→ 1 mark

Scheme of Valuation

Qn. No.		Marks
	$= (1)^3 + (.02)^3 + 3(1)(.02)(1+.02)$	
	$= 1 + .000008 + .061200$ → 1 mark	
	$= 1.061208$	
	$= 1.0612$ Correct to 4 decimal places → 1 mark	
39		
b)	Objective Function:	
	Minimise Cost $Z = 10x + 8y$ → 1 mark	
	where 'x' gms of the product M	
	and 'y' gms of the product N.	
	Constraints	
	$3x + 1y \geq 6$ → 1 mark	
	$x + y \geq 4$ → 1 mark	
	non-negativity constraints	
	$x, y \geq 0$. → 1 mark	
39		
(c)	Total Revenue $T.R = \int_0^{20} 5 - 10x + 3x^2$	
	$= 5x - 5x^2 + x^3 \Big]_0^{20}$ → 1 mark	
	$= (100 - 5(400) + 8000) - 0$	
	$= Rs.\ 6100$ → 1 mark	

Qn. No.		Marks
40		
a)	Average $= \frac{\text{Total marks}}{\text{no. of tests}}$ $\longrightarrow$ 1 mark	
	$55 = \frac{\text{Total marks}}{5}$	
	Total marks $= 55 \times 5 = \underline{\underline{275}}$ $\longrightarrow$ 1 mark	
	Total sum of the marks in all the first four tests $= 48 + 64 + 70 + 42$	
	$= 224$ $\longrightarrow$ 1 mark	
	$\therefore$ marks scored in the fifth test $= 275 - 224$	
	$= \underline{\underline{51}}$ $\longrightarrow$ 1 mark	
b)	$C(x) = 2x^2 - 3x + 6$	
	Av. cost $= \frac{2x^2 - 3x + 6}{x} = 2x - 3 + \frac{6}{x}$ $\longrightarrow$ 1 mark	
	Av. cost for an output of 30 units $= 2(30) - 3 + \frac{6}{30}$	
	$= 60 - 3 + \frac{1}{5}$	
	$= 57\frac{1}{5}$	
	$= \frac{286}{5} = \underline{\underline{57.2}}$ $\longrightarrow$ 1 mark	

Scheme of valuation :

Qn. No.		Marks
	marginal cost $f(x) = 4x - 3$ → 1 mark ∴ marginal cost for an output of 30 units $= 4(30) - 3$ $= Rs\ 117$ → 1 mark	
10 c)	$P(A \cap B) = P(A) + P(B) - P(A \cup B)$ $= \frac{1}{4} + \frac{2}{5} - \frac{1}{2}$ $= \frac{5+8-10}{20}$ $= \frac{3}{20}$ — 1 mark	
	$P(A/B) = \frac{P(A \cap B)}{P(B)}$ $= \frac{(3/20)}{(2/5)}$ $= \frac{3}{20} \times \frac{5}{2}$ $= \frac{3}{8}$ — 1 mark	

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