

DESIGN REPORT – IV

Submitted by



TEAM CRANKY

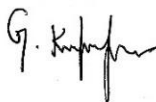
TEAM ID: BDC2023034

KONGU ENGINEERING COLLEGE

PERUNDURAI, ERODE-638 080

Presented for

Bicycle Design Competition (BDC) – 2023



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1.BILL OF MATERIALS

A Bill Of Material (BOM) plays a critical role in the development of any product. In essence, a BOM is a comprehensive list detailing all the components and sub-assembled parts and raw materials needed to build the product.

It helps us to accurately manage and oversee resources and identify materials to reduce wasteful spending. It also provides us with accurate information, which will help to make better decisions to manufacture the product efficiently and cost-effectively.

Tax Invoice									
Gemini Cycle Stores (22-23)				Invoice No.		Dated			
48/50, Culchery Street, ERODE - 638001				GR/214/22-23		24-Mar-23			
Ph: 9434225986				Terms of Delivery		Mode of Payment			
Mob: 9298001194 / 9443719040									
State Name: Tamil Nadu, Code: 33									
E-Mail: geminycycles@yahoo.co.in									
Buyer (Bill to)									
Cash									
State Name: Tamil Nadu, Code: 33									
Place of Supply: Tamil Nadu									
Sl No	Description of Goods	HSN/SAC	GST Rate	Quantity	Rate (incl of Tax)	Rate	per	Disc %	Amount
1	RAM MTB HANDLE BAR	87149900	12%	1 Ea	144.00	128.57	Ea		128.57
2	Ti Power Brake Set	87149400	12%	1 set	155.00	138.39	set		138.39
3	Ti Mtb Brake Lever	87149400	12%	1 set	100.00	89.29	set		89.29
4	ALLOY	87149400	12%	1 set	37.00	33.04	set		33.04
5	R.K.SLR BRAKE WIRE	87149400	12%	1 set	200.00	178.57	Ea		178.57
6	GENTS SET	87149510	12%	1 Ea	40.00	35.71	Ea		35.71
7	Big Ben Diana Seat B -1000	87149510	12%	1 Ea	45.00	40.18	set		40.18
8	Ram Mtb Seat Piller	87149900	12%	1 set	5.00	4.46	Ea		4.46
9	210 ZAG Colour	87149400	12%	2 Ea					8.92
10	Soni Slr Draw Bolt	87149400	12%	2 Ea					8.92
CGST OUTPUT									652.67
SGST OUTPUT									39.15
Rounded Off									0.03
Total									₹ 731.00
Amount Chargeable (in words)									E & O E
INR Seven Hundred Thirty One Only									
Taxable Value		Central Tax		State Tax		Total			
652.67		Rate: 6% Amount: 39.15		Rate: 6% Amount: 39.15		Tax Amount: 78.30			
Total:		652.67		39.15		78.30			
Tax Amount (in words) INR Seventy Eight and Thirty paise Only									
Declaration: I/We hereby declare that through our aggregate turnover in any preceding financial year from 2017-18 onwards is more than the aggregate turnover notified under sub-rule (4) of rule 45, we are not required to prepare an invoice in terms of the provisions of the said sub-rule.									
Customer's Seal and Signature									
Company's Bank Details: Gemini Cycle Stores (22-23) A/c Holder's Name: HDFC BANK C.A/C NO.30290017871550 Bank Name: HDFC BANK C.A/C NO.30290017871550 A/C No: 50290017871550 Branch & IFSC Code: for Gemini Cycle Stores (22-23)									
Authorized Signatory									
This is a Computer Generated Invoice									

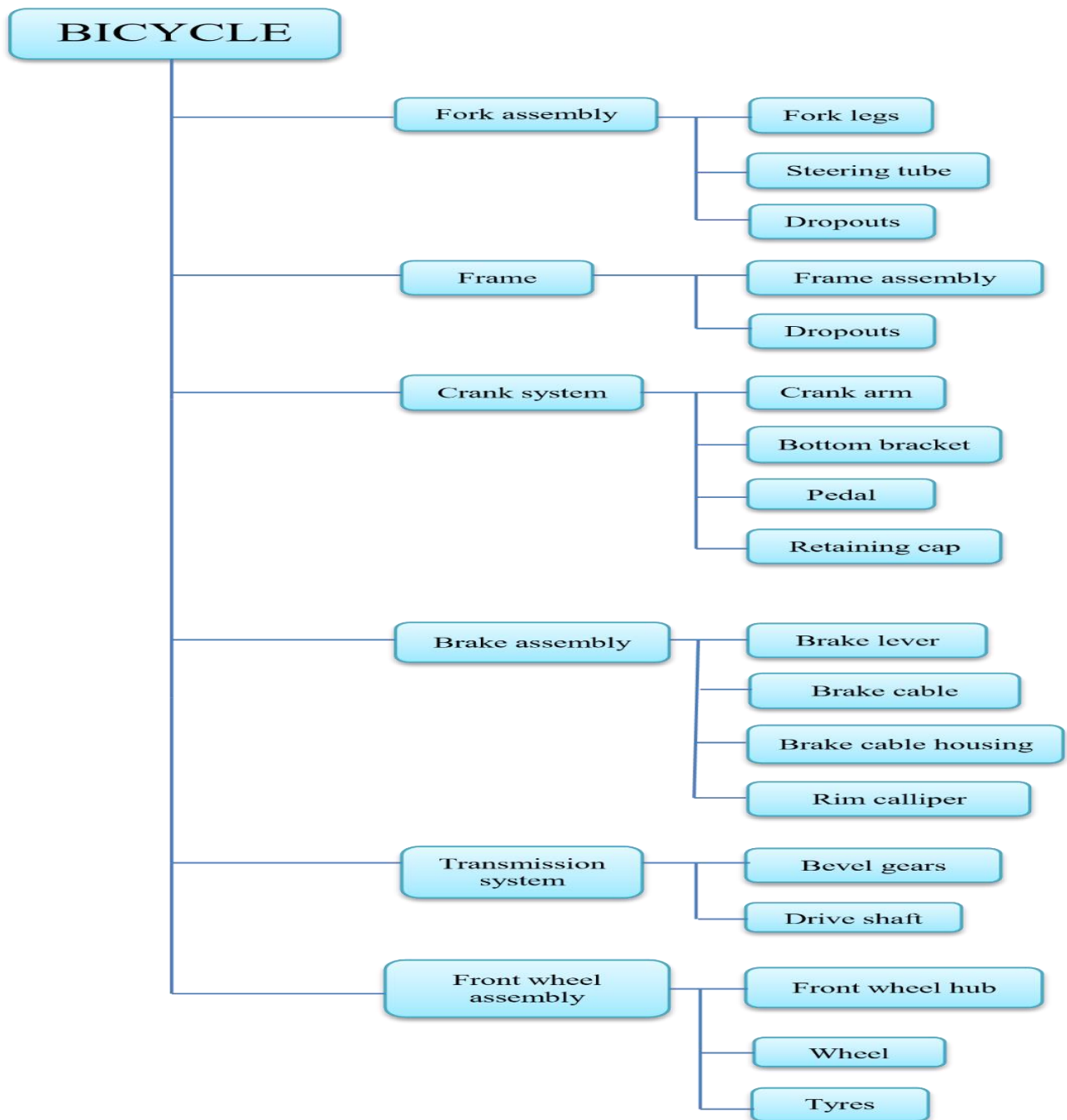
CYCLE PALACE			
CYCLE WORLD			
15/2, SATHIYA SAI NAGAR,			
2nd STREET PERUNDURAI MAIN ROAD,			
THINDAL, ERODE - 638012			
GSTIN/UIN: 33AMTPR5316B1Z2			
State Name: Tamil Nadu, Code: 33			
POS INVOICE			
Bill No. TR/2023/23	Time: 17:31 hrs		
Date: 28-3-2023	User: sales		
Buyer (Bill to): Karthick	Mob: 9944498696		
Sales Man:			
Sl Description	Qty	Rate	Amount
1 MUDG	1	300.00	267.86
URAD			
MTB			
2 SPARE S	1	20.00	17.86
			285.72
OUTPUT CGST @6%			17.14
OUTPUT SGST @6%			17.14
Total			320.00
CGST @6%			14
SGST @6%			14
Total			320.00
Total Paid			320.00
*2 YEARS FRAME WARRANTY *ONCE GOODS SOLD CANNOT BE RETURN *PLASTIC AND RUBBER ITEMS NOT CARRY ANY *EBIKE WARRANTY AS PER RESPECTIVE CO THANKS FOR VISITING CYCLE WORLD CUSTOMER CARE ERODE@CYCLEWORLD.IN MOB-ILE 9976137012			

2. ENGINEERING BILL OF MATERIALS

Simply known as E–BOM, it is a product recipe from design standpoint rather than manufacturing standpoint. It is arranged in the following part groups:

- ✓ Fork assembly
- ✓ Frame
- ✓ Crank system
- ✓ Brake system
- ✓ Transmission system
- ✓ Front wheel assembly
- ✓ Rear wheel assembly
- ✓ Steering
- ✓ Stand and seat
- ✓ Reflectors

3. E-BOM IN HIERARCHY



4. COST ESTIMATION BASED ON E-BOM

Based on the E- BOM, cost estimation of the bicycle is carried out. It is based on the company's production rate of 20,000 units per year, which would reduce the manufacturing cost of many components considerably.

4.1 COST REDUCTION

The main aim of any project is to reduce the cost as much as possible. Purchasing of raw materials and manufacturing all the components according to our needs from scratch can involve a lot of tasks, but the return on investment may be delay considerably. For example, for the frame of bicycle, the raw material, that is, chromoly steel isn't purchased as block, as the manufacturing of seamless tubes is expensive as it includes several processes (like heat treatment) which would increase the machinery and tooling cost significantly. So, the seamless tubes are bought from industries manufacturing them, customised for us extensively.

Each part/component can have several manufacturers, with different qualities and prices for the same part. As neither can be ignored, we've made sure to do thorough market research to come up with best possible solution to achieve required quality of the part at reasonable price.

COST SUMMARY REPORT

Total vehicle cost (Rs.) 3856.50

S.No	Assembly Description	Component	Description	Tooling	Unit cost (Rs.)	Quantity '(Nos)	Material Cost (Rs.)	Process Cost (Rs.)	Tooling Cost (Rs.)	Total Cost (Rs.)
1	Frame Assembly	Inclusive of all the components of frame (head tube, top tube, seat stay, chain stay, etc)	Seamless tube	Nil	240.00	1	240.00	0.00	0.00	715.75
			Cutting of tubes	Horizontal bandsaw	0.00	0	0.00	10.00	200000.00	150
			Butting	Tube butting machine	0.00	0	0.00	30.00	150000.00	50
			Welding	Frame fixture, welding equipment's	0.00	0	0.00	35.00	80000.00	55
		Dropout	Nil	Nil	3.00	2	0.00	0.00	0.00	6
	Frame Assembly	Sub-Total (Rs.)					240.00	75.00	430000.00	976.75
2	Fork assembly	Fork legs	Bending of Fork legs	Bending machine	240.00	0.5	120.00	30.00	200000.00	850.75
		Steering tube	Welding	Fork fixture, welding equipment's	0.00	0	0.00	30.00	70000.00	200
		Dropout	Nil	Nil	3.00	2	0.00	0.00	0.00	150
	Fork assembly	Sub-Total (Rs.)					120.00	60.00	270000.00	1200.75
3	Crank system	Crank arm	Steel alloy	Torque wrench	50.00	2	0.00	0.00	650.00	120
		Retaining cap	Steel alloy	Nil	9.00	2	0.00	0.00	0.00	20
		Pedal	Plastic	Pedal wrench, lubrication	20.00	2	0.00	0.00	1250.00	40
		Bottom bracket	Press fit type	Bottom bracket press set	170.00	1	0.00	0.00	800.00	200
	Crank system	Sub-Total (Rs.)					0.00	0.00	2700.00	380
4	Brake system	Brake lever	Steel alloy	Torque wrench	45.00	2	0.00	0.00	650.00	100
		Brake cable	Stainless steel	Cutter	10.00	2	0.00	0.00	900.00	20
		Brake cable housing	Plastic	Cutter	5.00	2	0.00	0.00	900.00	10
		Rim calliper	Side pull type	Wrench set(thin, box end, etc)	115.00	2	0.00	0.00	4300.00	220
	Brake system	Sub-Total (Rs.)					0.00	0.00	6750.00	350
5	Transmission system	Bevel gears	Grey cast iron	Nil	100.00	4	0.00	0.00	0.00	65
		Drive shaft	Steel	Nil	55.00	1	0.00	0.00	0.00	80
	Transmission system	Sub-Total (Rs.)					0.00	0.00	0.00	60

6	Front wheel assembly	Wheel + Spokes	Steel alloy	Nil	70.00	1	0.00	0.00	0.00	65
		Front wheel hub	Steel alloy	Nil	85.00	1	0.00	0.00	0.00	
		Tyre	Rubber	Nil	60.00	1	0.00	0.00	0.00	
	Front wheel assembly	Sub-Total (Rs.)					0.00	0.00	0.00	55
7	Rear wheel assembly	Wheel	Steel alloy	Nil	70.00	1	0.00	0.00	0.00	144
		Rear wheel hub	Steel alloy	Nil	100.00	1	0.00	0.00	0.00	
		Tyre	Rubber		60.00	1	0.00	0.00	0.00	
	Rear wheel assembly	Sub-Total (Rs.)					0.00	0.00	0.00	20
8	Steering	Handlebar	Chromoly Steel	Fixture	120.00	1	0.00	0.00	15000.00	10
		Stem	Threadless stem with face plate	Torque wrench	80.00	1	0.00	0.00	650.00	270
		Top cap	Steel alloy material	Nil	20.00	1	0.00	0.00	0.00	
		Grip	Rubber material	Air compressor	12.00	2	0.00	0.00	3000.00	40
		Bar end plug	Rubber	Nil	5.00	2	0.00	0.00	0.00	84
	Steering	Sub-Total (Rs.)					0.00	0.00	18650.00	50
9	Saddle and stand	Saddle	Roadbike saddle	Nil	45.00	1	0.00	0.00	0.00	20
		Saddle post	Steel	Wrenches	90.00	1	0.00	0.00	2000.00	
		Kickstand	Steel	Wrenches	50.00	1	0.00	0.00	2000.00	
	Saddle and stand	Sub-Total (Rs.)					0.00	0.00	4000.00	40
10	General Miscellaneous fit and finish	Reflectors	Plastic	Nil	10.00	2	0.00	0.00	0.00	432100
		Fasteners	For all systems	Nil	30.00	1	0.00	0.00	0.00	
										Total Cost (Rs.) 3856.5

4.2 OUTSOURCING PROCESSES

Certain processes can require more extensive machines, skilled labour which can increase the production cost. So, processes like those are outsourced. Here, manufacturing of bevel gears can be outsourced to reduce the investment. And outsourcing to the industries specializing in them won't compromise on the quality of the gears.

4.3 TOOLING AND TOTAL COST

The costing carried out shows that the tooling cost is Rs. 432100.00 which includes the fixtures for frame, fork, handlebar which would reduce the time taken for the processes to be carried out considerably, also the tools required for assembly of the components and the machines for processes like cutting of tubes, bending of forks, etc.

Based on the tooling cost and the total vehicle cost, selling of around 300 units can return the investment back. The tooling mentioned here doesn't include complete automation in any system but including such automation will reduce the production time drastically and also the operating cost, though the initial machinery cost will be large. This would produce more units than now and reduce the labour costs too and keeping the vehicle cost same, it can be profitable in the long run.

4.4 Design change decision based on cost review

Because of high cost we change aluminium material to Steel alloy material for frame assembly, we omit suspension system in the centre based on first bicycle design report - I due to the cost.

This is the final product of our bicycle:



5. Catalogue product

The advertisement is a collage with a central yellow and black geometric design. On the left, a stack of bicycles is shown. On the right, a cyclist in an orange jacket and helmet is riding through a forest. The central text and graphics are as follows:

Cranky
Pedal to success

*When in doubt
pedal it out!*

**Burn fat not
oil**

*Life is a
journey let it
ride*

PEDAL TO SUCCESS

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