Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Seventh Semester

AUTOMOBILE ENGINEERING

U18AUE0016**:** Vehicle Testing and Validation

COURSE OUTCOMES

CO1: Outline the basic measurement systems
CO2: Examine the vehicle body strength using crash tests
CO3: Explain the various engine performance testing methods
CO4: Estimate the different vehicle test parameters and its influence on fuel economy
CO5: Summarize the tests performed on steering, suspension and its impact on driving stability
CO6: List the tests conducted to analyse the transmission, brakes and wheel performance

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Matching type item with multiple choice code CO6 [K_2]

List I	List II
A. used in racing and rallying vehicles	i. Centrifugal Clutch
B. used in some heavy commercial vehicles to transmit high torque and small coefficient of friction in a wet system.	ii. Cone Clutch
C. used in mopeds, underbones, lawn mowers, go-karts, chainsaws, minibikes, scooters	iii. Single Plate Clutch
D. used in Buses, Trucks, and cars, used where large radial space is available	iv. Multiplate Clutch

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	ii	i
c)	ii	iv	i	iii
d)	iii	i	ii	iv

2. Trueness from the reference measures _____ CO1 [K_2]

a) Precision b) Mean

c) Accuracy d) Recall

3. In Measurement systems, which of the following characteristics are desirable CO1 [K1]

1. Accuracy
2. Sensitivity
3. Reproducibility

a) 1,3 b) 2,3

c) 1,2 d) 1,2,3

4. _____ is the degree of closeness with which a given value may be repeatedly measured. CO1 [K1]

a) Repeatability b) Reproducibility

c) Linearity d) Conformity

5. Assertion (A): Driver behavior can affect fuel economy; maneuvers such as sudden acceleration and heavy braking waste energy. CO4 [K2]

Reason (R): The fuel economy of an automobile is the fuel efficiency relationship between the distance traveled and the amount of fuel consumed by the vehicle.

a) Both A and R are Individually true and R is the correct explanation of A

b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

6. _____ is defined as the ratio of power output to the power developed in a cylinder CO3 [K1]

a) Volumetric Efficiency b) Brake Thermal Efficiency

c) Indicated Thermal Efficiency d) Mechanical efficiency

7. Constant radius circle tests were used to evaluate the vehicles' _____ characteristics CO5 [K2]

a) Understeer b) Oversteer

c) Braking d) Lane change

8. According to Global NCAP the speed at which a car undergoes a crash test is CO2 [K2]

a) 35 mph b) 55 mph

c) 64 mph d) 43 mph

9. Assertion (A): Dynamic simulation sled testing can represent various automotive collision conditions CO2 [K2]

Reason (R): Deceleration conditions during sled testing are not reproducible and can be tuned

to simulate collision events that occur during vehicle impacts with a fixed barrier or vehicle.

a) Both A and R are Individually true, and R is the correct explanation of A

b) Both A and R are Individually true, but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

10. _____ is the least distance between the lower end of the vehicle body or chassis and the road. CO4 [K_2]

a) Wheel Base

b) Distance of Center of gravity

c) Ground Clearance

d) Axle Distance

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11.	Differentiate between Reproducibility and Repeatability.	CO1	[K_2]
12.	Compare static and dynamic error in a measurement system.	CO1	[K_2]
13.	Summarize the need and application of Sled tests.	CO2	[K_3]
14.	Illustrate why are crash tests done at a particular speed specified by NCAP.	CO2	[K_2]
15.	Explain brake horse power and how it is different from indicated horse power.	CO3	[K_2]
16.	What is an Absorption dynamometer and its types?	CO3	[K_2]
17.	Outline the sensors required for Road-load measurements.	CO4	[K_2]
18.	Summarize the parameters that can be tested in Corrugated Test Track.	CO5	[K_2]
19.	What is Dynamic cornering fatigue?	CO6	[K_2]
20.	How do you test for leaks in hydraulic brakes?	CO6	[K_2]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 350 words)

21.	a)	Illustrate in detail the layout of Closed loop measurement system, mention its advantages, disadvantages, and its applications.	9	CO1	[K_2]
	b)	Identify either closed loop or open loop measurement system used in the dryer of the washing machine to dry the clothes and give the reason for your answer with a layout of operations, what are its advantages, disadvantages.	5	CO1	[K_3]
22.	a)	Describe the sled test procedure for frontal impact.	14	CO2	[K_2]
23.	a)	Explain the working of Prony brake dynamometer with a neat sketch, what are	7	CO3	[K_2]

		the advantages and disadvantages.			
	b)	Explain the working of Rope brake dynamometer with a neat sketch, what are the advantages and disadvantages.	7	CO3	[K_2]
24.	a)	Outline the Measurement Procedure for Free Acceleration Test	7	CO4	[K_2]
	b)	Analyze the effects of various parameters like transmission, acceleration, vehicle weight, gradability and rolling resistance, driver behavior on the fuel economy of the vehicle.	7	CO4	[K_3]
25.	a)	Explain the given three test methods Constant radius (for varying speeds), Constant steering-wheel angle (for varying speeds), Constant speed	14	CO5	[K_2]
26.	a)	List down the test procedure for road hazard impact test for wheel and tyre assemblies and also the performance criteria of wheels to pass the test.	7	CO6	[K_2]
	b)	Summarize the test procedure for Drawbar pull test used to test parking brakes.	7	CO6	[K_2]

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