QPC: RD20BTECH423 AR 20 Reg. No

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fifth Semester – Regular) Examinations, December – 2022

BPCAG5011 – Tractor Systems and Control

(Agricultural Engineering)

Time: 3 hrs Maximum: 70 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) **(1 x 10 = 10 Marks)**

Q.1. Answer ***ALL*** questions	[CO#]	[PO#]
a. The rate of doing work at the rate of 4500 kg-m per minute i. Hp ii. KwH iii. Kw iv. Watt	CO3	PO2
b. In a differential with a gear ratio of 4 : 1 the drive pinion would revolve four times to cause the ring gear to rotate i. 16 times ii. 1 time iii. 4 times iv. Twice	CO3	PO3
c. In Disc clutch, the clutch disc acts as a i. Driving ii. Neutral iii. Driven iv. Any of these	CO2	PO2
d. The following factor(s) contribute to the effectiveness of the brakes i. Area of brake linings ii. Amount of pressure applied to shoe brakes iii. Radius of wheel iv. All of the above		
e. How many gears are there in a differential unit, if number of star gears are 4? i. 4 ii. 6 iii. 10 iv. 8	CO1	PO2
f. Maximum noise level from a tractor near the operator's ear should not exceed: i. 100 dB ii. 85 dB iii. 95 dB iv. 90 dB	CO3	PO4
g. Ballasting helps in i. Slow tread wear ii. Increase in drawbar pull iii. Reduction in Slippage iv. All of these		
h. Average body surface area of a man will be: i. 122 m^2 ii. 2 m^2 iii. 1.5 m^2 iv. 5 m^2	CO2	PO4
i. The comfortable range of temperature in tractor cabin is: i. 291-297^oK ii. 18-24 ^oK iii. 98-100 ^oK iv. 200-250^oK	CO1	PO5
j. Cage wheel used in tractor for improving: i. Weight Transfer ii. load iii. Traction iv. Ballasting	CO3	PO4

PART – B: (Short Answer Questions) **(2 x 10 = 20 Marks)**

Q.2. Answer ***ALL*** questions	[CO#]	[PO#]
a. What is a differential lock? Why it is necessary in tractor?	CO1	PO2
b. Tractor weighing 28kN has wheel base 2150 mm and moving hill at no load. Its CG is located 900 mm located of centre of rear wheel axle & 750 mm above the ground surface. Determine maximum uphill slope the tractor can climb without overturning upwards.	CO2	PO2

c.	Describe about final drive of a tractor.	CO2	PO5
d.	A hydraulic pump delivers 12 litres of fluid per minute against pressure of 250 bar. Calculate the hydraulic power.	CO3	PO3
e.	Find the tractive efficiency if the coefficient of traction and gross traction are: 0.42 and 0.64 respectively and the slippage is 10%.	CO2	PO1
f.	What are the different methods for finding a CG of a tractor?	CO3	PO2
g.	Briefly explain the method of recharging of a lead acid battery.	CO3	PO2
h.	What do you mean by wheel ballasting?	CO2	PO2
i.	Differentiate between Motor and Generator	CO1	PO2
j.	If a tyre represents 8.25 x 20 x12, what does it represent?	CO1	PO2

PART – C: (Long Answer Questions) **(10 x 4 = 40 Marks)**

	Answer ***ALL*** questions	Marks	[CO#]	[PO#]
3. a.	A 4 wheel tractor having a weight of 28.5 KN is resting on an horizontal surface. the wheel base is 2.08 m. the reaction at front wheel is 9.0 KN. calculate Rear wheel reaction.	5	CO1	PO2
b.	Derive a relation between pump overall efficiency, pump volumetric efficiency and mechanical efficiency for a fixed displacement pump.	5	CO2	PO2
	(OR)			
c.	Define Ballasting? Explain various method of ballasting highlighting its importance.	5	CO2	PO2
d.	Tractor is taking a turn at a radius of 5.56 m on concrete road without application of brakes. The height of CG of a tractor is 900 mm and the distance of CG from tractor tipping axis is 600 mm. Calculate the critical turning of tractor at which lateral tipping would occur.	5	CO1	PO2
4. a.	Explain the working of pilot operated relief valve with neat sketch	5		
b.	Draw and explain about the starting unit in an electrical system of a tractor.	5	CO1	PO2
	(OR)			
c.	A hydraulic motor is required to develop a torque of 1225 Nm at a maximum speed of 600 rpm. The maximum pressure drops across the motor is to be 150 bar. The torque and volumetric efficiencies are both 0.9. Determine the a) suitable motor Displacement b) Flow required in the motor in l/min.	5	CO2	PO2
d.	Explain the working of a differential with neat sketch.	5	CO3	PO2
5. a.	A rear wheel drive tractor with total weight of 23kN has a wheel base of 2100mm and centre of gravity is 710 mm ahead of rear axle centre line. the tractor is pulling a level drawbar of 15 kN on a concrete surface at a forward speed of 6km/h and drawbar height is 485mm. the axle power is 35 kW. Determine Weight transfer on rear axle.	5	CO2	PO2
b.	Explain Ackerman steering system in detail.	5	CO2	PO2
	(OR)			
c.	Explain the working of Single plate and dual clutch with neat diagram.	5	CO2	PO2
d.	Enlist the type of transmission/gear box in automobiles. Explain constant mesh gear in detail.	5	CO3	PO2
6. a.	A single clutch plate with both sides effective has an outer diameter of 30 cm and inner diameter of 20 cm. The maximum intensity of pressure at any point in the contact surface is not to exceed $1kg/cm^2$. If the coefficient of friction is 0.3., determine the horsepower transmitted by a clutch with speed of 2000 rpm.	5		
b.	Derive the weight transfer equation of tractor under parallel conditions with neat sketch.	5	CO3	PO3
	(OR)		CO2	PO4
c.	Derive the conditions of longitudinal stability of a tractor with neat sketch.	5	CO3	PO2
d.	Describe the steering geometry with neat sketch.	5	CO3	PO2

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