A		Reg. No. :										
		Question Pap	er (Cod	e: 5	570	1					
	B.E	E./B.Tech. DEGREE EX	KAM	INA	TIOI	N, A	PRII	201	9			
		Fifth S	Seme	ester								
		Mechanica	l Eng	ginee	ring							
		15UME501 -DYNAM	4ICS	OF	MAC	CHIN	VER	Y				
		(Regula	tion	2015)							
Dur	ation: Three hours							Ma	axim	um:	100	Marks
		Answer Al	LL Ç	Juest	ions							
		PART A - (10	x 1	= 10	Marl	ks)						
1.	The unit of inertia torque is										CO1	
	(a) N/m (b) Nm (c) J/m (d) N						l) N/	mm ²	2			
2.	The ratio of the maximum fluctuation of speed to the mean speed is CO1-2 called											
	(a) Fluctuation of speed		((b) Maximum fluctuation of speed								
	(c) Coefficient of f	luctuation of speed	(d) N	one c	of the	ese					
3.	The unit of centrifugal force is											CO2
	(a) N	(b)Nm		(c) ľ	√m				(d)	kg/n	n^3	
1.	The partial balanci	ng means										CO2
	(a) Balancing partially the revolving masses											
	(b) Balancing partially the reciprocating masses											
	(c) Best balancing of engines											
	(d) All of the above											
5.	When a body is subjected to transverse vibrations, the stress induced in a body will be								CO3			
	(a) Tensile stress.		(b) C	ompr	ressiv	ve sti	ess.				
	(c) Shear stress.		(d) Lo	ongit	udin	al str	ess.				

6.	When there is a reduction in amplitude over every cycle of vibration, then the body is said to have								
	(a) Free vibration	(b) Forced vibrati	on (c) Damped vibration	(d) None of these					
7.	When there is a reduction in amplitude over every cycle of vibration,CO4then the body is said to have								
	(a) Free vibration.		(b) Forced vibration.						
	(c) Transverse vibr	ation.	(d) Damped vibration.						
8.	In vibration isolation system, if $\omega/\omega n > 1$, then the phase difference CC between the transmitted forceand the disturbing force is								
	(a) 0°	(b) 90°	(c) 180°	(d) 270°					
9.	When the speed of the engine fluctuates continuously above andCO5-below the mean speed, then the governor is said to be								
	(a) Stable.	(b) Unstable.	(c) Isochronous.	(d) Hunt.					
10.	The movement of a	CO5- R							
	(a) Pitching.	(b) Steering.	(c) Gyroscopic couple.	(d) Rolling.					
PART - B (5 x 2 = 10 Marks)									
11.	What is the function of flywheel?								
12.	Differentiate static and dynamic balancing. CO2- R								
13.	Define damped vibration. CO								
14.	Define Isolation factor.								
15.	Write some applications of gyroscope.								
		PART – C	C (5 x 16= 80Marks)						
16.	(a) A vertical petrol engine 150 mm diameter and 200 mm stroke has CO1-App (16) a connecting rod 350 mm long. The mass of the piston is 1.6 kg and the engine speed is 1800 rpm. On the expansion stroke with crank angle 30^{0} from the top dead centre, the gas pressure is 750 KN/m ² . Determine the net thrust on the connecting rod, velocity and acceleration of slider, angular velocity and angular acceleration of the connecting rod and torque on the crank. Or								

(b) A multi-cylinder engine is to run at a speed of 600 r.p.m. On CO1- App (16) drawing the turning moment diagram to a scale of 1 mm = 250 N-m and 1 mm = 3°, the areas above and below the mean torque line in mm2 are : +160, -172, +168, -191, +197,

– 162, The speed is to be kept within \pm 1% of the mean speed of the engine. Calculate the necessary moment of inertia of the flywheel. Determine the suitable dimensions of a rectangular flywheel rim if the breadth is twice its thickness. The density of the cast iron is 7250 kg/m³ and its hoop stress is6 MPa. Assume that the rim contributes 92% of the flywheel effect.

17. (a) A shaft carries four masses in parallel planes A, B, C and D in CO2- App (16) this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle betweenthe masses at B and C is 100° and that between the masses at B and A is 190°, both being measured in the same direction. The axial distance between the planes A and B is 100 mm andthat between B and C is 200 mm. If the shaft is in complete dynamic balance, determine:

1. The magnitude of the masses at A and D;

2. The distance between planes A and D; and 3. the angular position of the mass at D.

Or

- (b) A, B, C and D are four masses carried by a rotating shaft at radii CO2- App (16) 100,125,200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B,C and D are 10 kg,5 kg and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance.
- 18. (a) A machine of mass 75 kg is mounted on spring and is fitted with CO3- Ana (16) a dashpot to damp out vibrations. There are three springs each of stiffness 10 N/mm and it is found that the amplitude of vibration diminishes from 38.4 mm to 6.4 mm in two complete oscillations. Assuming that the damping force various as the velocity, determine: (i) the resistance of the dash pot at unit velocity (ii) the ratio of the frequency of the damped vibration to the frequency of the undamped vibrations and (iii) the periodic time of the damped vibrations.

Or

(b) A shaft of length 1.25 m is 75 mm in diameter for the first 275 CO3- Ana (16) mm of its length, 125 mm in diameter for the next 500 mm length, 87.5 mm in diameter for the next 375 mm length and 175 mm in diameter for the remaining 100 mm of its length. The shaft

carries two rotors at two ends. The mass moment of inertia of the first rotor is 75 kg m² whereas of the second rotor is 50 kgm². Find the frequency of natural torsional vibrations of the system. The modulus of the rigidity of the shaft material may be taken as 80 GN/m^2 .

19. (a) A mass of 10 kg is suspended from one end of a helical spring, CO4 -Ana (16) the other end being fixed. The stiffness of the spring is 10 N/mm. The viscous damping causes the amplitude to decrease to one-tenth of the initial value in four complete oscillations. If a periodic force of 150Cos50t N is applied at the mass in the vertical direction, find the amplitude of the forced vibrations. What is its value of resonance?

Or

- (b) A spring mass system is excited by a force F sin ωt . On CO4 Ana (16) measuring the amplitude of vibration is found to be 12 mm at resonance. However, at a frequency 0.8 times the resonant frequency, the amplitude reduces to 8 mm. Determine the damping ratio of the system.
- 20. (a) A Porter governor has equal arms each 250 mm long and pivoted CO5-App (16) on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor.

Or

(b) Each paddle wheel of a steamer has a mass of 1600 kg and a CO5-App (16) radius of gyration of 1.2 meters. The steamer turns to port in a circle of 160 meters radius at 24 km/hr. The speed of the paddle is 90 rpm.Find the magnitude and effect of the gyroscopic couple acting on the steamer.