Total No. of Questions – [08] Total No. of Printed Pages 03

G.R. No.	

Paper Code:- U359-152(ESE)

DECEMBER 2019/ENDSEM

T. Y. B. TECH. (MECHANICAL) (SEMESTER - I)

COURSE NAME: Dynamics of Machinery

COURSE CODE: MEUA31172

(PATTERN 2017)

Time: [**2 Hours**] [Max. Marks: **50**]

(*) Instructions to candidates:

1) **Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q.1) a) What is mean by turning moment diagram? Explain in detail turning moment diagram for single cylinder four stroke IC Engine? [6 marks]

OR

b) A single cylinder horizontal steam engine has a stroke of 0.75 m and a connecting rod 1.8 m long. The mass of reciprocating parts is 520 Kg and that of the connecting rod is 230 Kg, centre of gravity of the connecting rod is 0.8m from crank pin and the moment of inertia about an axis through the centre of gravity perpendicular to the plane of motion is 100 kg m^2 .For an engine speed of 90 rpm and a crank position of 45^0 from the IDC, determine the torque on the crankshaft due to the inertia of these part by analytical method. [6 marks]

Q.2) a) Determine the time required to accelerate a counter shaft of rotating mass 500 kg and radius of gyration of 200 mm to the full speed of 250 rpm from rest through a single plate clutch of internal and external radii 125 mm and 200 mm, taking coefficient of friction as 0.3 and axial spring force of 600 N. Assume that only one side of clutch is effective. [6 marks]

OR

b) A single Block brakes as shown in Fig. (a) has a brake drum of diameter of 2m. it required braking torque 500Nm at 300rpm clockwise. The coefficient of friction is 0.25. Determine the required force P to be applied at the end of lever when (i) Angle of contact is 30^0. (ii) Angle of contact is 90^0.

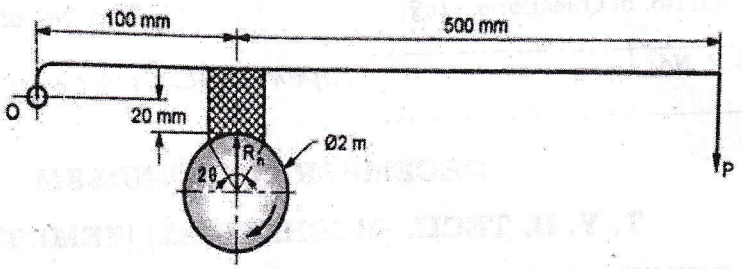

Fig.(a) [6 marks]

Q.3) a) A four cylinder in-line engine running at 2000rpm is having crank and connecting rod lengths of 60 mm and 240 mm respectively. The mass of reciprocating parts of each cylinder is 2 Kg. The cylinders are spaced 160 mm apart and the cranks appear at 90^0 intervals in an end view. If the firing order of the engine is 1-4-2-3. Determine the unbalanced primary force and couple. [Use Graphical Method] [6 marks]

OR

b) Explain the partial balancing of reciprocating engine [6 marks]

Q.4) a) A pinion having 25 teeth drives a gear having 60 teeth. The profile of the gear is involute with 14.5^0 pressure angle,4 mm module and addendum 4 mm. Find the length of path of contact and contact ratio. [4 marks]

OR

b) Prove that the change in center distance within limits of involutes gears will not affect the velocity ratio. [4 marks]

Q. 5) a) A three start worm has a pitch diameter of 80 mm and a pitch of 20 mm. It rotates at 600 rpm and drives a 40 teeth worm gear, if coefficient of friction is 0.05. find: [i] the helix angle of the worm [ii] the speed of the gear [iii] the center distance [iv] the efficiency and maximum efficiency. [6 marks]

b) Derive the relation for virtual number of teeth of helical gear. [4 marks]

c) A pair of bevel gears in mesh have their shafts intersecting at an angle of 60^0. Its velocity ratio is 1.5. Find the pitch angles of the gears. [4 marks]

OR

Q.6) a) Derive the expression for pitch cone angles of Bevel gears. [6 marks]

b) Define the terminologies with neat sketch for worm :

[i] Axial pitch [ii] Helix angle of worm

[iii]Lead [iv] Lead angle. [4 marks]

c) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 40 teeth gear. The helix angle is 25^0 and the normal pressure angle is 20^0. The normal module is 3 mm. Calculate: i] Transverse module ii] Transverse pressure angle iii] Axial pitch iv] Pitch circle diameters of the pinion and gear. [4 marks]

Q.7) a) Fig.(b) shows diagrammatically a compound epicyclic gear train. Wheel A, D and E are free to rotate independently on spindle O, while B and C are compound and rotate together on spindle P, on the end of arm OP. All the teeth on different wheels have the same module. A has 12 teeth B has 30 teeth and C has 14 teeth cut externally. Find the number of teeth on wheels D and E which are cut internally. If the wheel A is driven clockwise at 1 rps, Determine the magnitude and direction of the angular velocities of arm OP and wheel E. [6 marks]

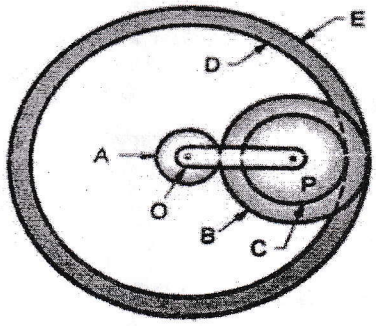

Fig (b)

b) Explain with neat sketch: Reverted Gear Train [4 marks]

c) Explain with neat sketch: Epicyclic Gear train [4 marks]

OR

Q.8)a) Fig (c)shows a differential gears used in motor car. The pinion A on the propeller shaft has 12 teeth and gears with the crown gears B, which has 60 teeth. The shafts P and Q from the rear axle to which the road wheels are attached. If the propeller shaft is rotates at 1000 rpm, and the road wheel attached to axle Q has a speed 210 rpm, while taking a trun, find the speed of the road wheel attached to axle P.

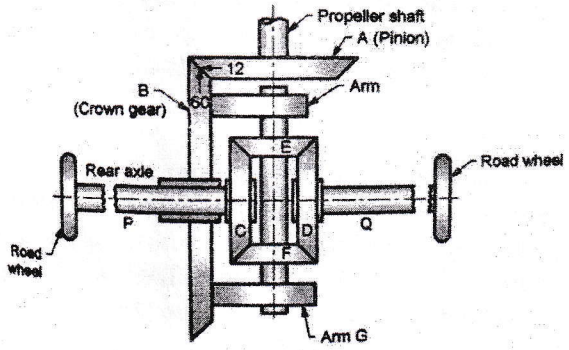

Fig (c) [6 marks]

b) Explain with sketch: Humpage gear Box (Epicyclic gear train with bevel gears) [4 marks]

c) Explain Tabulation method for sun and planet gear train. [4 marks]

---------********---------