

## FOURTH SEMESTER

**B.E. (ME)**

MID SEMESTER EXAMINATION **MARCH 2005**

### ME-211 THERMAL ENGINEERING I

Time: 1 Hour 30 Minutes

Max. Marks : 20

**Note :** Answer **ALL** questions.

Use of Psychrometric chart and steam tables are allowed.

Assume suitable missing data, if any.

- 1[a] Using T-S diagram, prove that, for the same quantity of heat added, increase of compression ratio increases the thermal efficiency of an otto cycle. (2)
- [b] Determine air standard efficiency of the Diesel cycle if the compression ratio is 15 and heat is supplied up to 5% of the stroke. If the cut off is increased from 5% to 10%, find the change in air standard efficiency.  
If the compression ratio is increased from 15 to 20 and the cut off is adjusted to give the same air standard efficiency. Find the required change in cut off. (5)
- 2[a] Draw actual value timing diagram for four stroke petrol engine and discuss it. (2)
- [b] What factors limit the delivery pressure in a reciprocating compressor? (2)
- [c] A three stage compressor is used to compress air from 1 bar to 27 bar. The law of compression in all stages is  $PV^{1.3} = \text{Constant}$ . The temperature at the beginning of compression is 300 K. The inter cooling is assumed to be perfect. If the volume of air compressed is 150 m<sup>3</sup> of air per minute, measured at inlet conditions, what is the power consumptions of the compressor. Neglect clearance. (4)

3[a] Explain the following terms

(i) W.B.T

(ii) D.P.T

(iii) Degree of saturation

(iv) Relative humidity (2)

[b] The atmospheric air at 30°C D.B.T and 40% RH is cooled to 15°C D.B.T. Calculate the heat removed if the supply of air is 150 m<sup>3</sup>/min. (3)

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## FOURTH SEMESTER

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MID SEMESTER EXAMINATION MARCH 2005

### ME-212 MECHANICS OF SOLIDS-I,

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.  
Assume suitable missing data, if any.

- 1[a] Derive the expressions for the normal and shear stresses on a plane inclined at an angle  $\phi$  for a biaxial normal stress state. (4)
- [b] At a point in a material there are normal stresses on  $30 \text{ N/mm}^2$  and  $60 \text{ N/mm}^2$  tensile, together with a shearing stress of  $22.5 \text{ N/mm}^2$ . Calculate the principal stresses and the inclination of the principal planes to the direction of the  $60 \text{ N/mm}^2$  stress. (4)
- 2 The compound bar shown in Fig.1 is in the unstressed condition at a temperature of  $10^\circ\text{C}$ . Calculate the stresses in steel and aluminum bars at  $60^\circ\text{C}$ .  
For steel,  $E_s = 200 \text{ GN/mm}^2$  and  $\alpha_s = 12 \times 10^{-6} \text{ per}^\circ\text{C}$   
For aluminum,  $E_a = 60 \text{ GN/m}^2$  and  $\alpha_a = 24 \times 10^{-6} \text{ per}^\circ\text{C}$  (6)

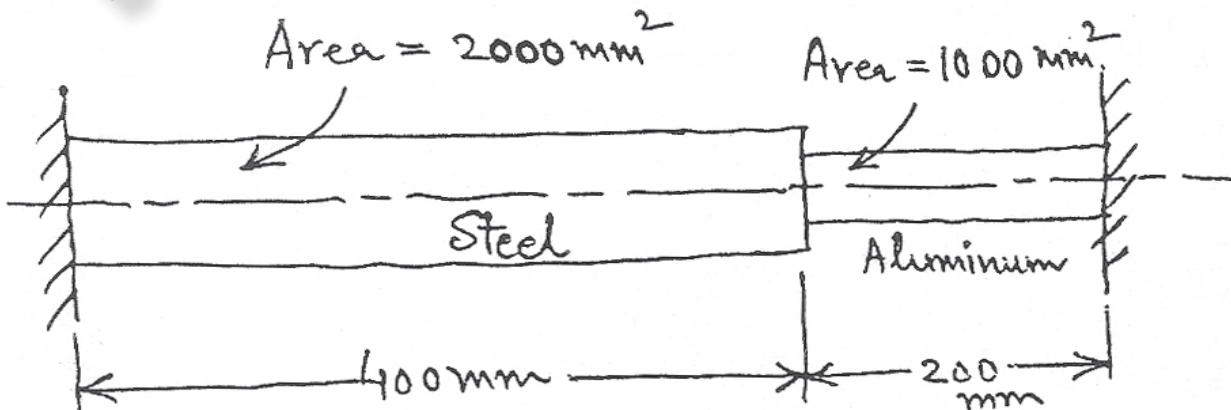


Fig. 1



- 3 Draw B.M. and S.F. diagrams for the overhanging beam shown in Fig.2. (6)

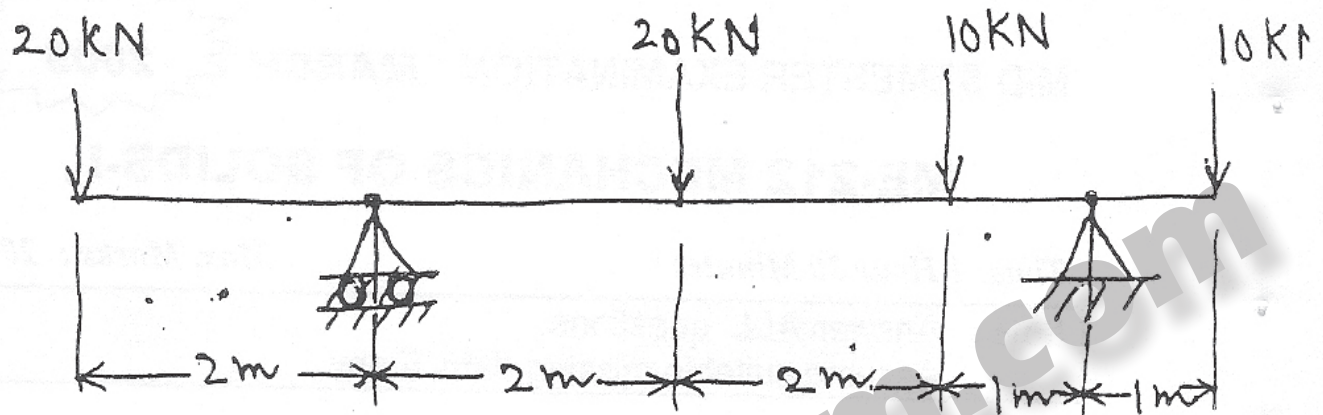


Fig. 2

**FOURTH SEMESTER****B.E. (ME)****MID SEMESTER EXAMINATION MARCH 2005****ME-213 KINEMATICS OF MACHINES**

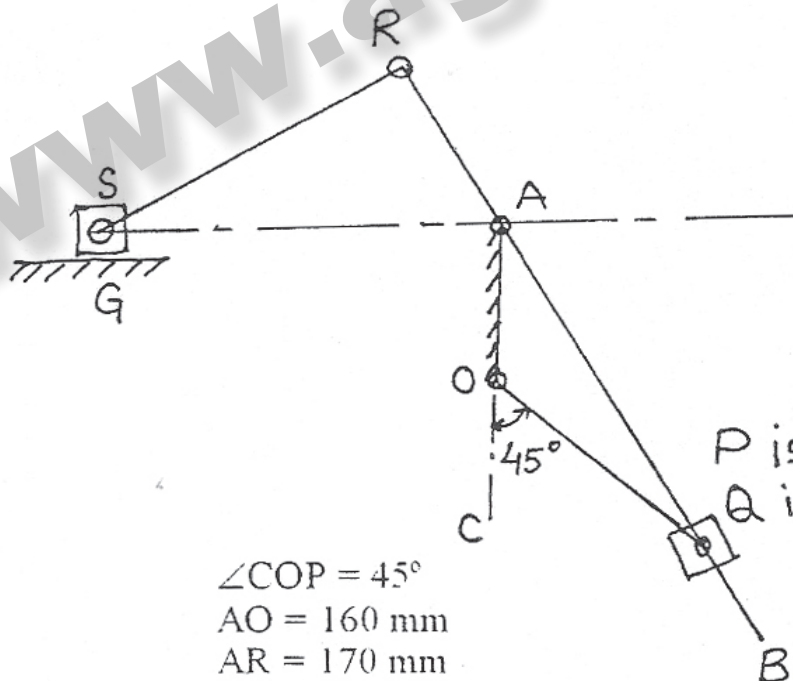
Time: 1 Hour 30 Minutes

Max. Marks : 20

**Note :** Answer **ALL** questions.

Assume suitable missing data, if any.

- 1[a] Differentiate between
- Revolute pair and prismatic pair.
  - Kinematic pairs of cam with roller follower and geared system.
- [b] A Whitworth quick-return mechanism has been shown in the Fig.1 and determine :
- the velocity of the ram.
  - the velocity of the slider P on the slotted lever.
  - the angular velocity of the link RS.



$$\angle COP = 45^\circ$$

$$AO = 160 \text{ mm}$$

$$AR = 170 \text{ mm}$$

$$RS = 350 \text{ mm}$$

$$OP = 200 \text{ mm}$$

$$\text{Velocity of crank OP} = 30 \text{ rpm.}$$

P is on slider  
Q is on AB

- 2 A plate cam with a reciprocating follower is to be driven by a constant speed motor. The follower is to rise from a dwell with cycloidal motion to the top in 0.2 second, dwell for 0.02 sec., return with S.H.M. in 0.15 second and then again dwell for 0.03 second in complete rotation. During the rise  $y'_{\max}$  is 7 cm/rad. Determine the complete specification of displacement diagram and draw the displacement, velocity and acceleration diagram.

6

- 3 A machine is driven from a constant speed shaft rotating at 300 rpm by means of a friction clutch. The moment of inertia of the rotating parts of the machine is  $8.0 \text{ kg-m}^2$ . The clutch is of the disc type and both sides of disc are effective in producing driving friction. The external and internal diameter of the disc are 200 mm and 100 mm respectively. Assuming uniform rate of wear of the clutch, the intensity of pressure is not to be more than  $120 \text{ kN/m}^2$  and coefficient of friction 0.28. The machine is at rest, the clutch is suddenly engaged. What length of time will be required for the machine to attain its full speed? Also determine the energy loss in slipping of the clutch?

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## FOURTH SEMESTER

B.E. (ME)

MID SEMESTER EXAMINATION MARCH 2005

### ME-214 ELECTRICAL TECHNOLOGY-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer any ALL questions.  
Assume suitable missing data, if any.

- 1 Justify the following statements :
- [a] Starting current of a 3-phase induction motor is very large.
  - [b] When a 3-phasesupply is given to balanced 3-phase winding, rotating magnetic field is produced.
  - [c] Rotor core losses are negligible in 3-phase induction motor.
  - [d] A 3-phase induction motor never runs at synchronous speed.
  - [e] Single phase induction motors are inherently not self starting in nature. (1x5)
- 2 A 400V, 25 hp, 4 pole, 50Hz, 3-phase, star connected induction motor has the following circuit parameters as referred to stator:
- |                   |                   |                     |
|-------------------|-------------------|---------------------|
| $r_1 = 0.6\Omega$ | $x_1 = 1.1\Omega$ | $X_\phi = 25\Omega$ |
| $r_2 = 0.3\Omega$ | $x_2 = 0.5\Omega$ |                     |
- The mechanical losses are 1000W and stator core losses are 500W. The slip is 3 %. Find
- [a] Stator current
  - [b] Air Gap Power developed
  - [c] Rotor Copper Losses
  - [d] Load torque
  - [e] Efficiency (1x5)
- 3[a] Explain different methods of speed control of 3-phase induction motor. (3)
- [b] An 8-pole, 50Hz induction motor runs at 720 rpm when on full load. What is (a) the slip of the rotor, (b) the speed of the stator field with reference to stator, (c) speed of the stator field with

reference to rotor, (d) frequency of rotor currents (e) speed of rotor field with reference to rotor conductors (f) speed of rotor field with reference to stator conductors? (3)

4[a] Explain the operation of single phase induction motor on the basis of double revolving field theory. (2)

[b] A 220 V, 50 Hz, 6-pole, 1/6 hp single phase induction motor has  $r_1 = 11.4\Omega$ ,  $r_2' = 13.8\Omega$ ,  $x_1 = x_2' = 14.3\Omega$  and  $X_\phi = 275\Omega$ . Find torques due to forward and backward field components and gross torque. (3)

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## FOURTH SEMESTER

B.E. (ME/PE)

MID SEMESTER EXAMINATION MARCH 2005

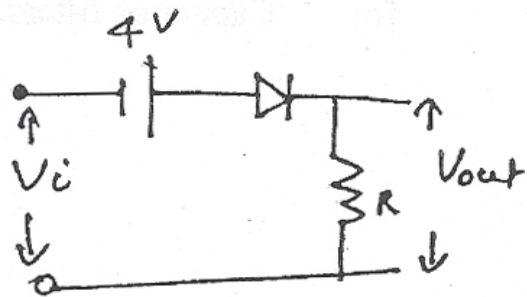
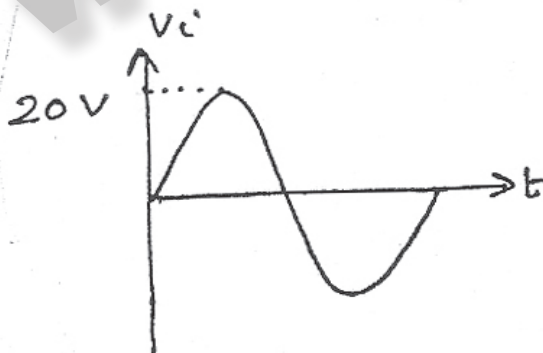
### ME/PE-215 ELECTRONICS

Time: 1 Hour 30 Minutes

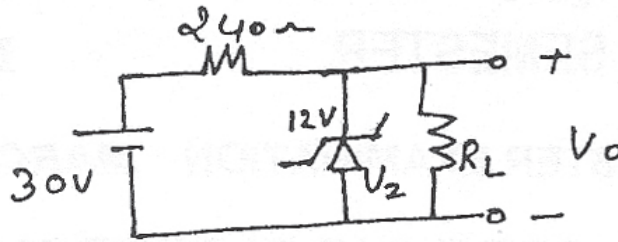
Max. Marks : 20

Note : Answer ALL questions.  
Assume suitable missing data, if any.

- 1[a] Explain Energy Band Theory with the help of a neat sketch.  
[b] Distinguish between minority carriers and majority carriers in semi conductor.  
[c] Explain why the width of base regions in a transistor is kept very small as compared to other regions?  
[d] Define Q-point with reference to a transistor. (4)
- 2[a] Explain the working of a bridge rectifier with the help of a neat sketch. (2)  
[b] Derive the expression for ripple factor in a full wave rectifier. (2)
- 3[a] Sketch the output waveform for the network showing in Fig.1 (2)

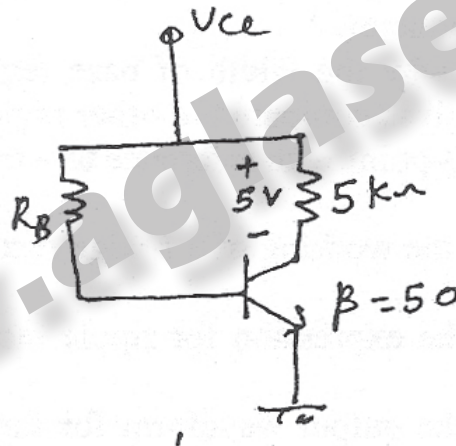


- [b] Determine the output voltage  $V_0$  and the power dissipated by the zener diode for the circuit shown in Fig.2. (2)



- 4[a] With the help of a neat circuit diagram explain the output characteristics of Common Emitter configuration of a transistor. (3)

- [b] Calculate the collector current and base current of transistor shown in Fig.3. (1)



- 5 Write short notes on any *TWO* of the following :

- [a] Compare Avalanche breakdown and zener breakdown
- [b] Compare the three transistor configuration (CE,CB,CC)
- [c] Capacitor filters.

(4)